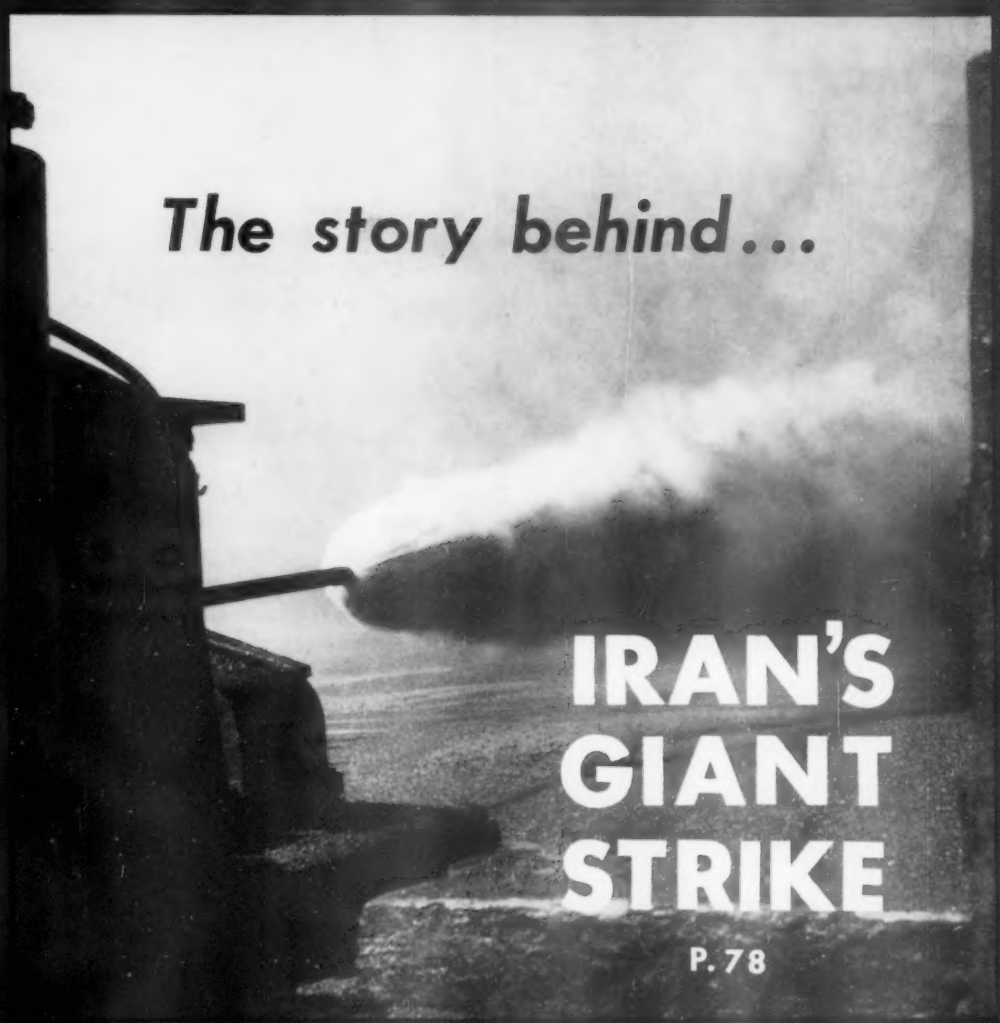
the OIL AND GAS JOURNAL

JANUARY 21, 1957



The story behind...

IRAN'S GIANT STRIKE

P. 78

World's Biggest Pipeline System in the Making • p. 58

Lane-Wells

POWER-PAK CHARGES

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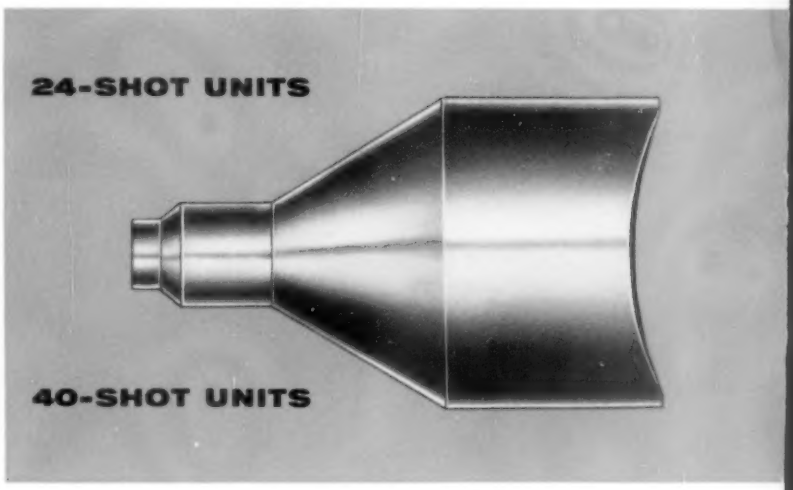

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Tomorrow's Tools - Today!

A Glance Ahead

- **Mexican gas reserves** again are catching the eye of U. S. transmission companies. Texas Eastern broke the ice. Two other firms have now tried to make a deal with Petroleos Mexicanos.

  There are two reasons for the current interest: The principle of importing gas has been established. And large reserves are being developed just south of the border. Firms now relying on Southwest and Gulf Coast gas see Mexico as a secondary supply source—just as they earlier turned to Canada. It's possible that a few years will see Canadian and Mexican gas mixed in the mains of New York City and points west.

- **Fracturing in California** is expected to spread. Techniques have now been developed for coping with the thicker, dirtier sand sections in the area. New treatments use as much as 400,000 lb. of sand and more than 4,000 bbl. of oil. They're yielding good results in a number of old fields.

- **Isomerization of pentanes, hexanes, and heptanes** on a widespread commercial basis is still about 2 years away. But this may not be true of butane isomerization. At the end of World War II 30 such plants had a capacity of 37,650 bbl. a day. Only about six of these survived. But now the idea is being revived because of added interest in alkylation for motor-fuel octanes. At least two new isobutane facilities are now committed, and more will follow.

- **Some refiners may abandon** conservative methods of depreciating processing equipment. In the past they reasoned that taxes would not be lower and they would profit by longer-term depreciation. But some now fear that future auto and airplane engines will require lower-grade fuels, making heavy investments in high-octane facilities obsolete. A shorter-term writeoff is becoming more attractive.

- **Spread of professional unionism** in the oil industry is worrying some leaders among engineers. It's being encouraged, they say, by lack of sizable pay boosts for men with several years' experience. Beginning engineers, they say, command salaries almost as high as 4 to 6-year men. But after the initial high paycheck, there's little increase.

  In some instances management has adjusted salaries to make the differential bigger. But most haven't, and many engineers think the unions will make inroads on their profession as a result.

- **Profit studies show why** more drilling contractors are going offshore—and why still others are giving the move a hard look.

  They regard offshore drilling as their best bet, even after looking at the huge investment and the risk involved. Next best from a profit standpoint is foreign operations. And at the bottom, according to some, is highly competitive, medium-depth drilling.

The OIL AND GAS JOURNAL

JANUARY 21, 1957 • VOLUME 55 • NUMBER 3

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EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

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TECHNOLOGY–OPERATION

Refining-Processing

Corrosion Rates Measured Directly by New Method 85
By D. H. Stormont

A new electrical-resistance method for determining corrosion directly measures loss of metal from a probe installed in the system under study. Field and plant tests show the method is quick and accurate.

New Design Proves Successful for Process Heaters 88
By Ralph Morrow

This new design offers the refiner a more efficient utilization of costly radiant-section tube surface. The principle involved is the double-firing of vertically suspended tube banks. Four such heaters have been in operation since 1953.

On The Job . . . In The Plants 116

Hinged bracket supports 6-in. stanchions—Portable elevator makes rugged flying scaffold—Television in pilot-plant operations—How insulation is fastened to vessels.

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The Story Behind the 5 Alborz 78
By B. Mostofi and August Gansser

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How To Evaluate an Oil Property 97
By E. A. Polumbus, Jr.

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By Claude F. Horton

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By Lester A. Coon

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Tips on Trainee Instruction 121

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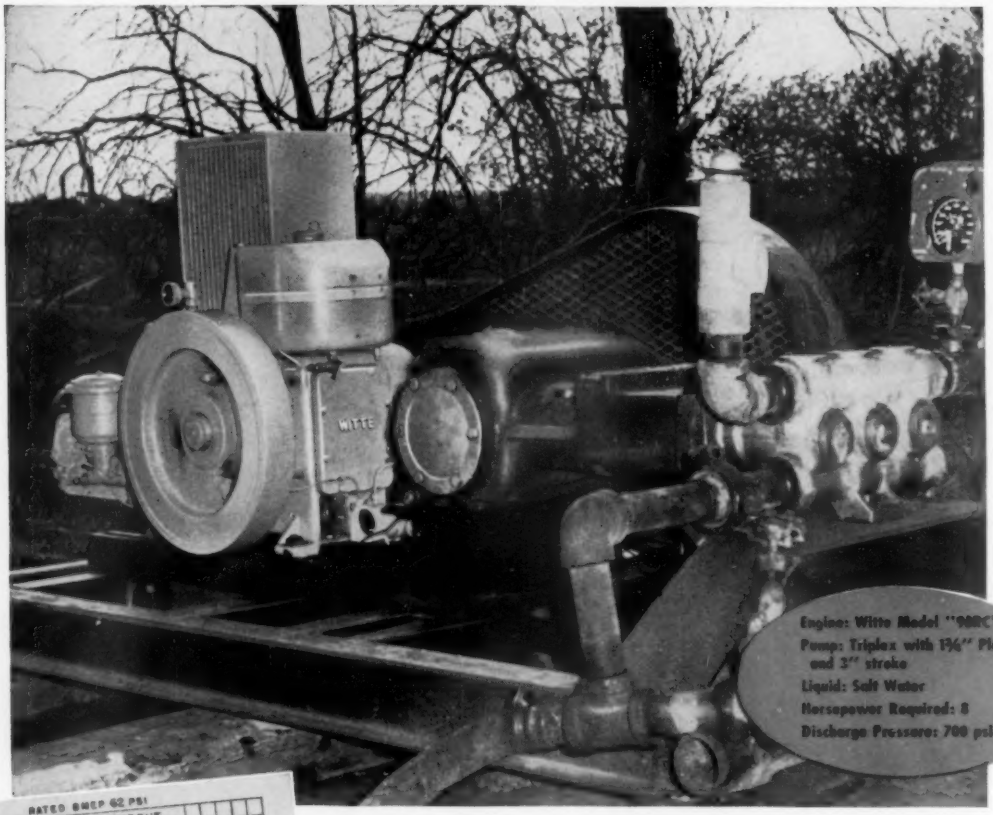
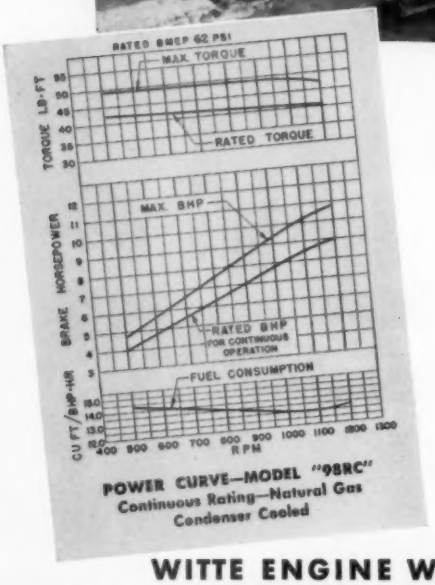

Engine: Witte Model "98RC"
Pump: Triplex with 1¾" Plungers and 3" stroke
Liquid: Salt Water
Horsepower Required: 8
Discharge Pressure: 700 psi



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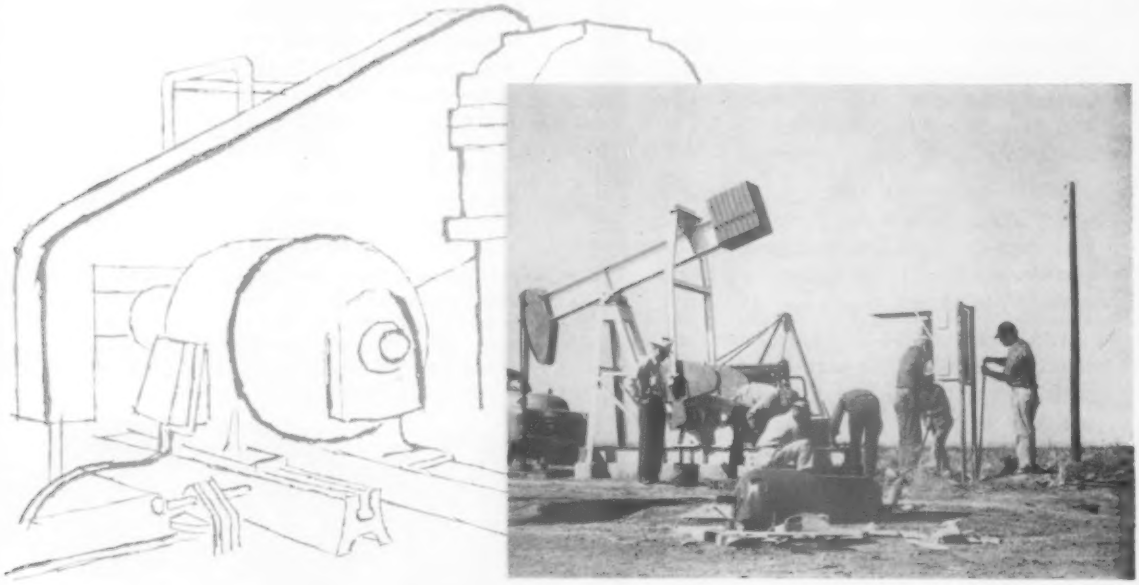

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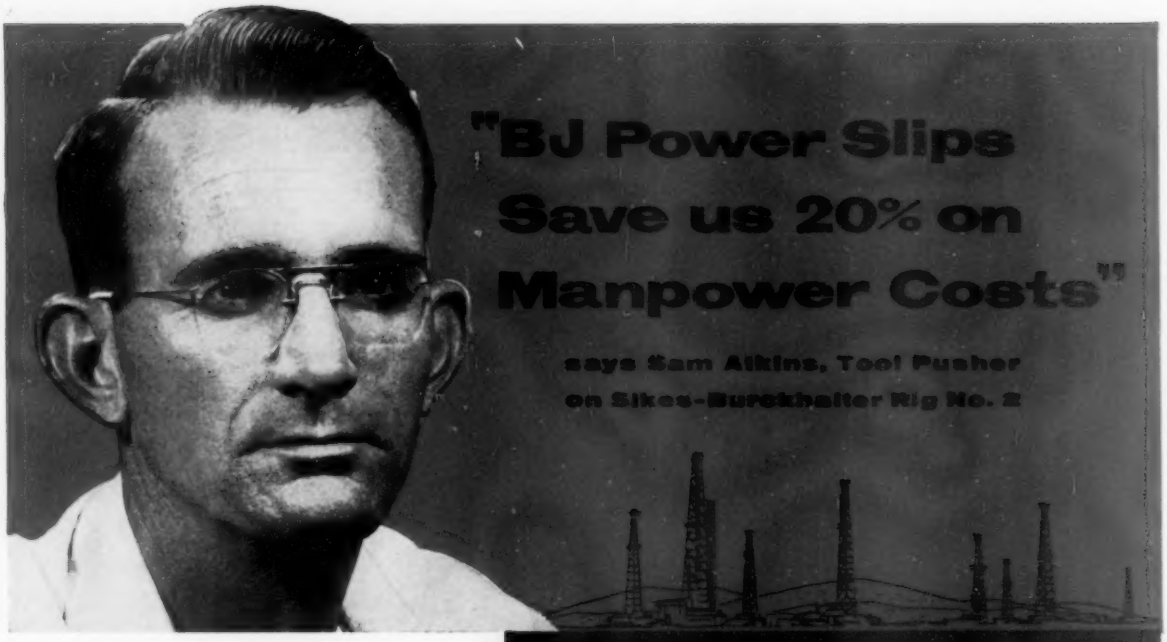

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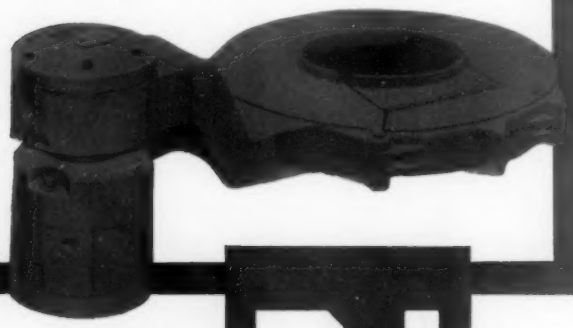

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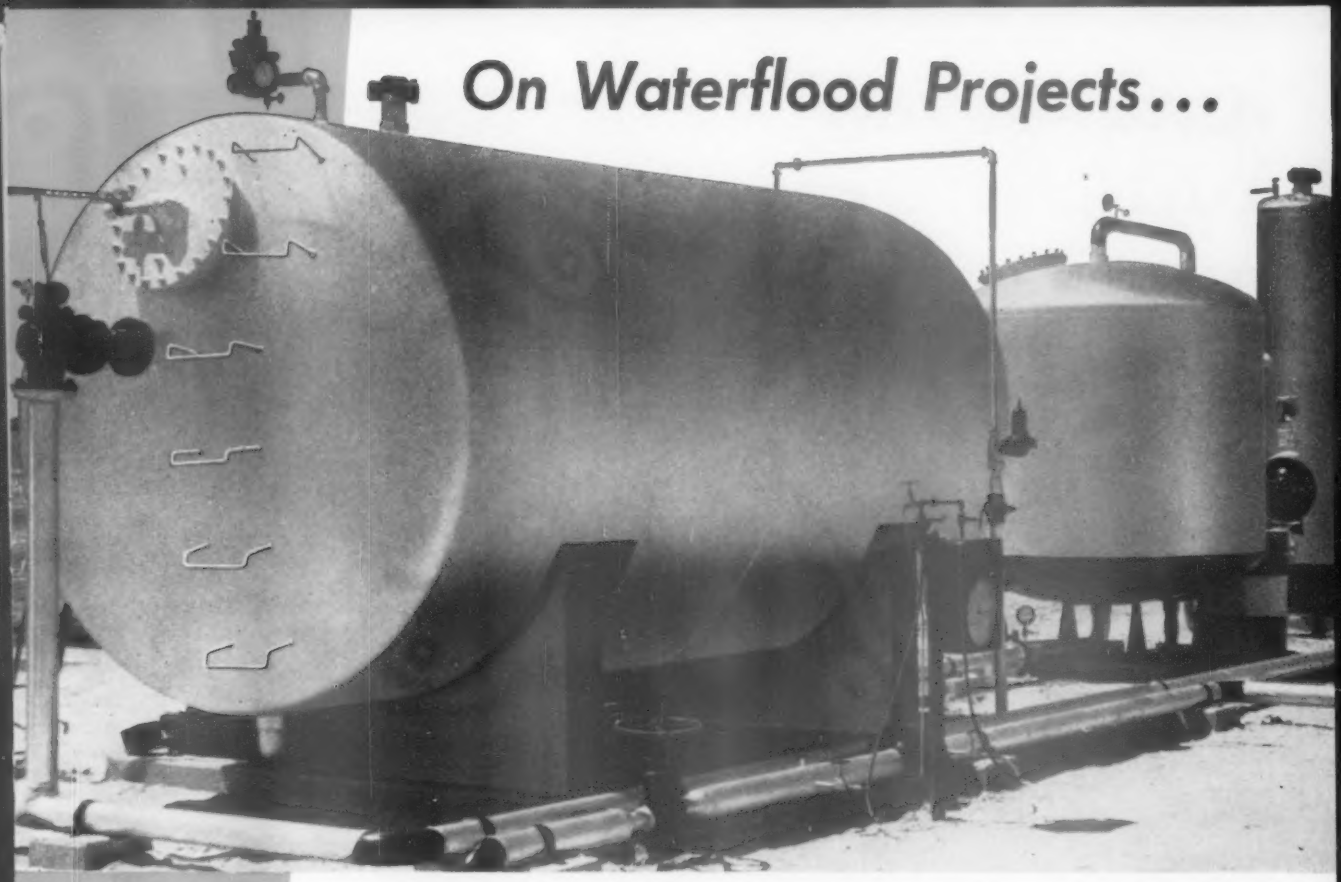

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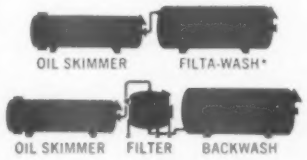

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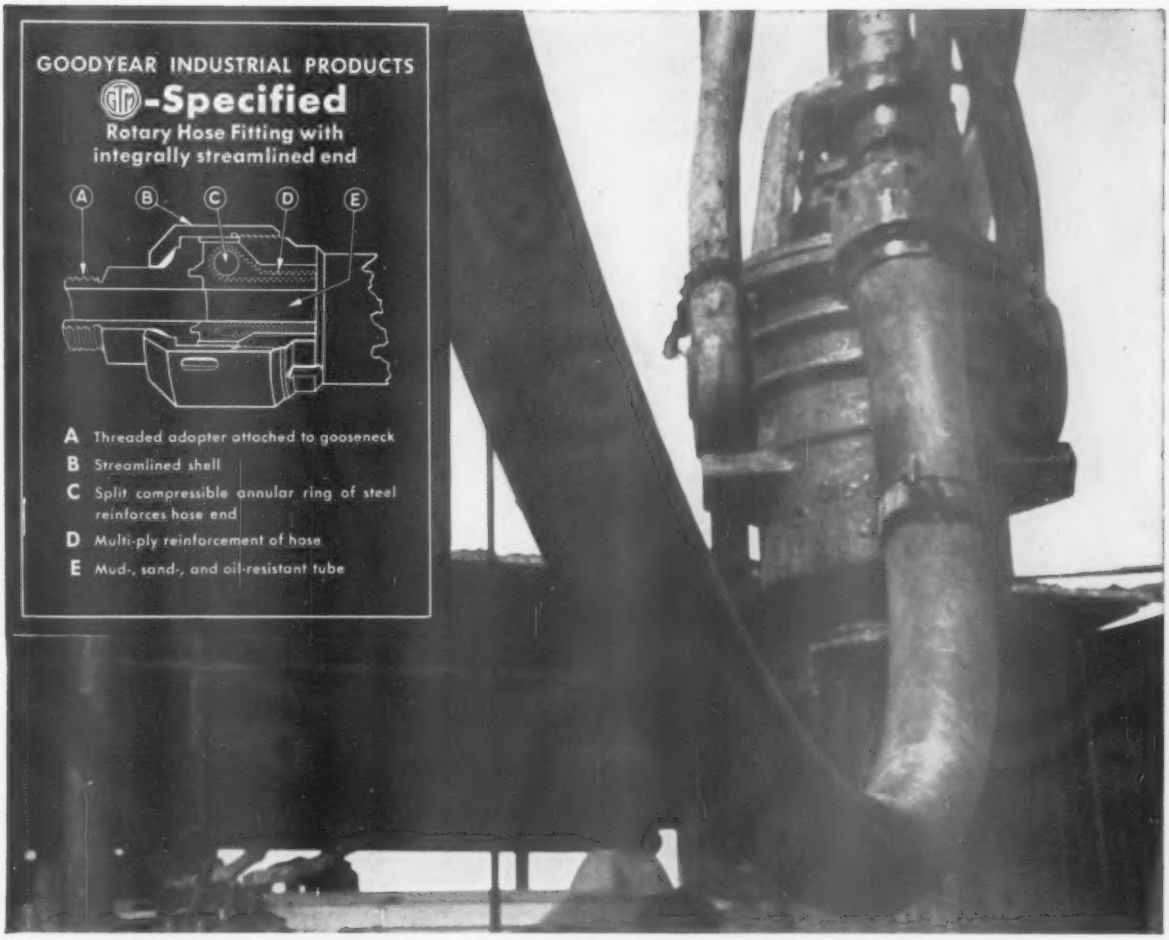

G.T.M.-Specified Rotary Hose "like new" after 16 wells

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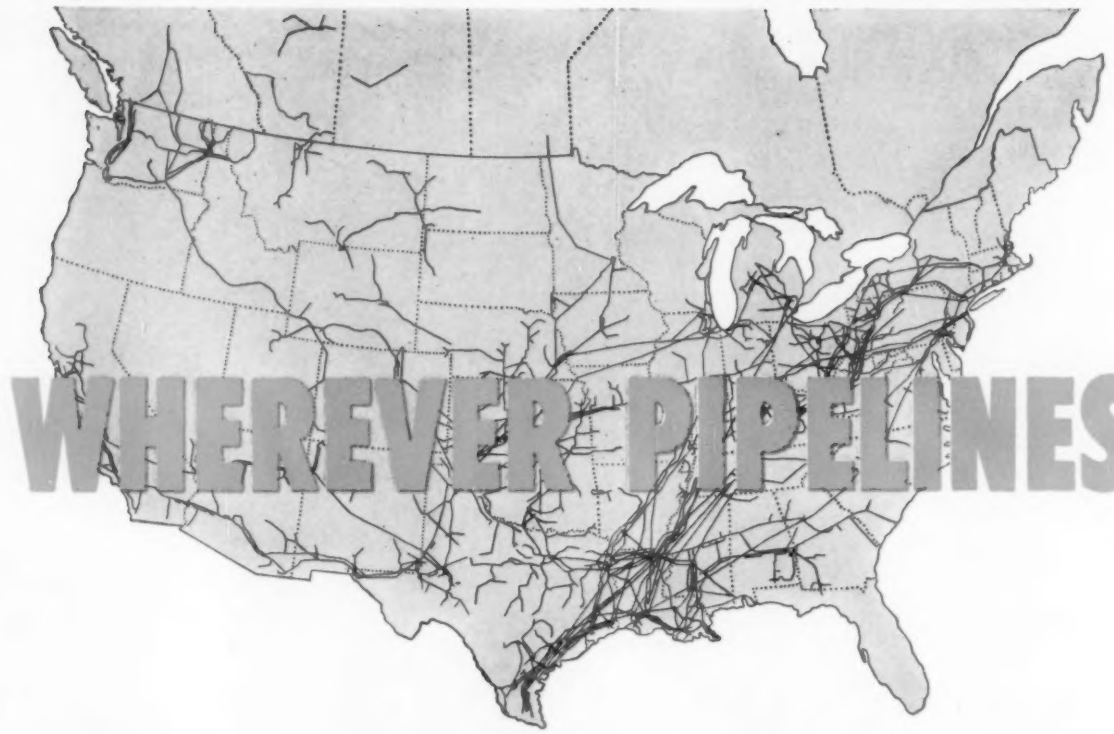
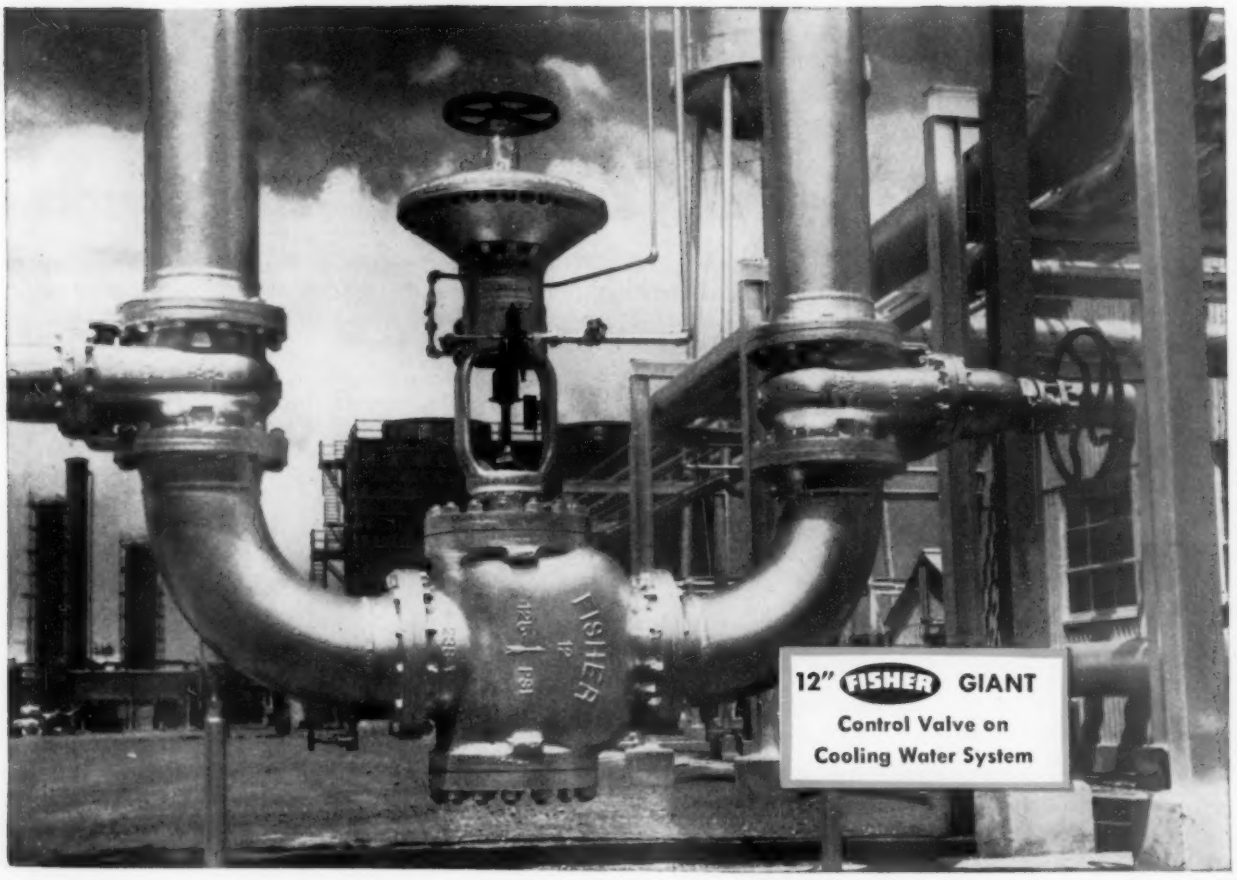


WHEREVER PIPELINES



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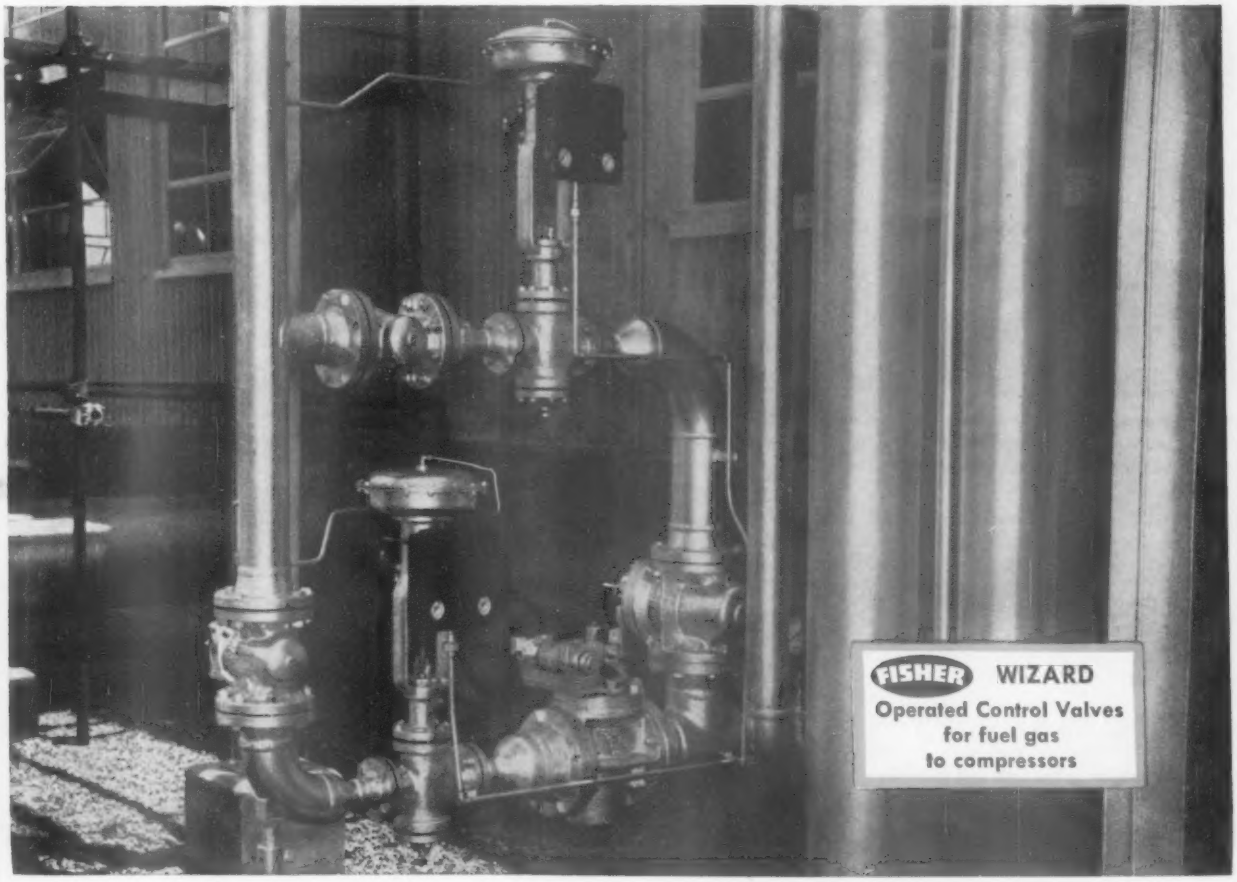

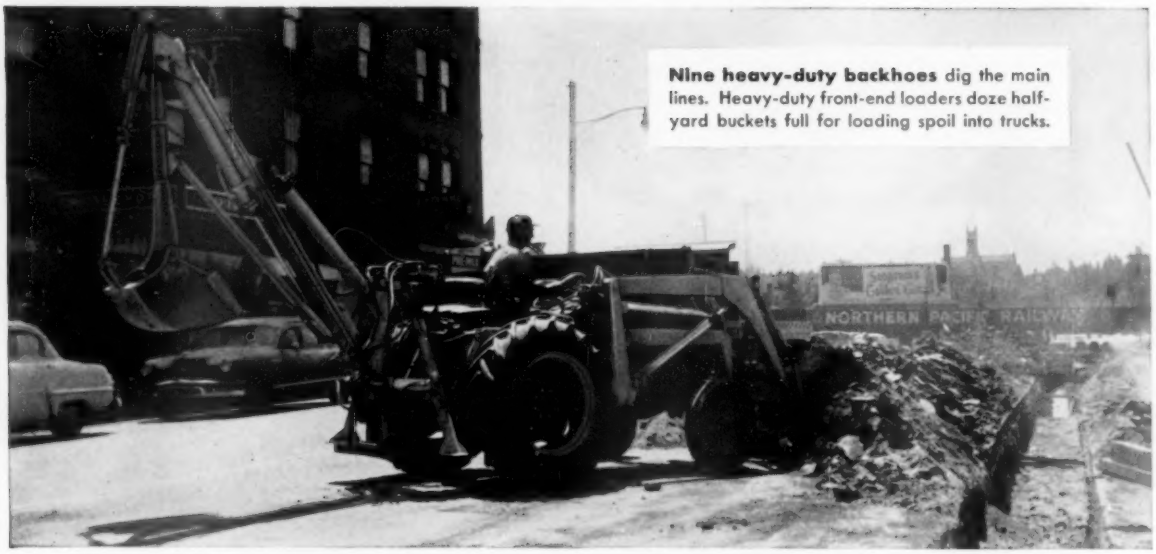

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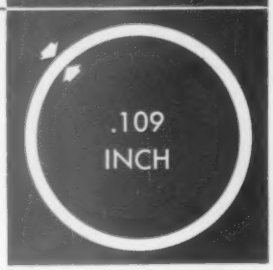
...the new, still more powerful INTERNATIONAL 350 UTILITY

Response like you've never known! Feel the smooth, new power of the engine. See the new, even more rugged, extra-heavy-duty front axle. Add these to many other time-tested features . . . the new International 350 Utility gives greater cost-cutting capacity than ever. Choose gasoline, LP Gas, or diesel engine.

Why pay extra for this.....

When you need only this.....



Armco supplies Welded Steel Pipe to meet requirements in the Natural Gasoline and Natural Gas Divisions and wherever else you need dependable line pipe.

When your pipeline calls for light wall pipe, you can easily get what you need from the wide range of wall thicknesses available in Armco pipe.

Many lines such as gas gathering lines for natural gasoline plants, gasoline plant piping, and residue gas lines do not require expensive, heavy wall pipe. Yet the lightest wall pipe available from many suppliers is ¼-inch wall thickness.

Armco Pipe is supplied in many thicknesses from $\frac{9}{64}$- to ½-inch. You select what you need without paying for excess metal. Also, you can choose from 20 different diameters of Armco Pipe, ranging from 6 to 36 inches.

WRITE FOR DATA

Write for complete information applied to your needs. Armco Drainage & Metal Products, Inc., Welded Pipe Sales Division, 3647 Curtis Street, Middletown, Ohio. 201 KOME Building, Tulsa, Oklahoma. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

ARMCO WELDED STEEL PIPE

NEWS OF CHEMICALS FROM **KOPPERS**...

Why GULF uses dbpc® antioxidant

dbpc antioxidant, made by Koppers, is an effective oxidation inhibitor for gasoline, anti-knock fluids, insulating oils and industrial oils. It is easy to handle and does not require special precautions. It produces no detrimental side effects. It is low in cost.

In gasoline it can be added early in the refining process before appreciable oxidation occurs. This can be done because **dbpc** is not extracted by sweetening, caustic washing, clay treating, or water washing.

In industrial oils, **dbpc** is an effective color stabilizer that helps prevent sludge formation. In insulating oils, it does not affect dielectric strength.

The combination of good inhibiting properties and *lack* of bad characteristics recommended **dbpc** to Gulf Oil Corporation. The same combination may reduce the cost of inhibiting your petroleum products. Send for complete information. Koppers Company, Inc., Chemical Division, Dept. OGJ-17, Pittsburgh 19, Pennsylvania.

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Sales Offices: PITTSBURGH · NEW YORK · BOSTON · PHILADELPHIA · ATLANTA · HOUSTON · DETROIT · CHICAGO · LOS ANGELES · SAN FRANCISCO

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WORKED 6½ YEARS WITHOUT OVERHAUL

Since he first switched to GM Detroit Diesel Power

• Looking for a Diesel that's a workin' fool? One that'll keep going year in and year out without overhauls? Brother, you're looking for a General Motors 2-cycle Detroit Diesel.

But don't take our word for it. Ask Driller Marion Berry of Indiana's V.T. Drilling Company. He's bossing a GM Twin "4-71" Detroit Diesel driving Cardwell draw works that ran 6½ years before its first overhaul. He says, "one real advantage of GM Detroit Diesels is their fuel economy. Their smooth operation saves tools and their quick acceleration speeds round trips, too."

No matter where you're drilling, there's a GM Diesel Distributor or Dealer close by, ready to supply parts and service fast. And they're ready to give you all the information you want about GM Detroit Diesel power (single engines—30 to 300 h.p., multiple units—up to 893 h.p.) for your rig. Why not call the one nearest you today?

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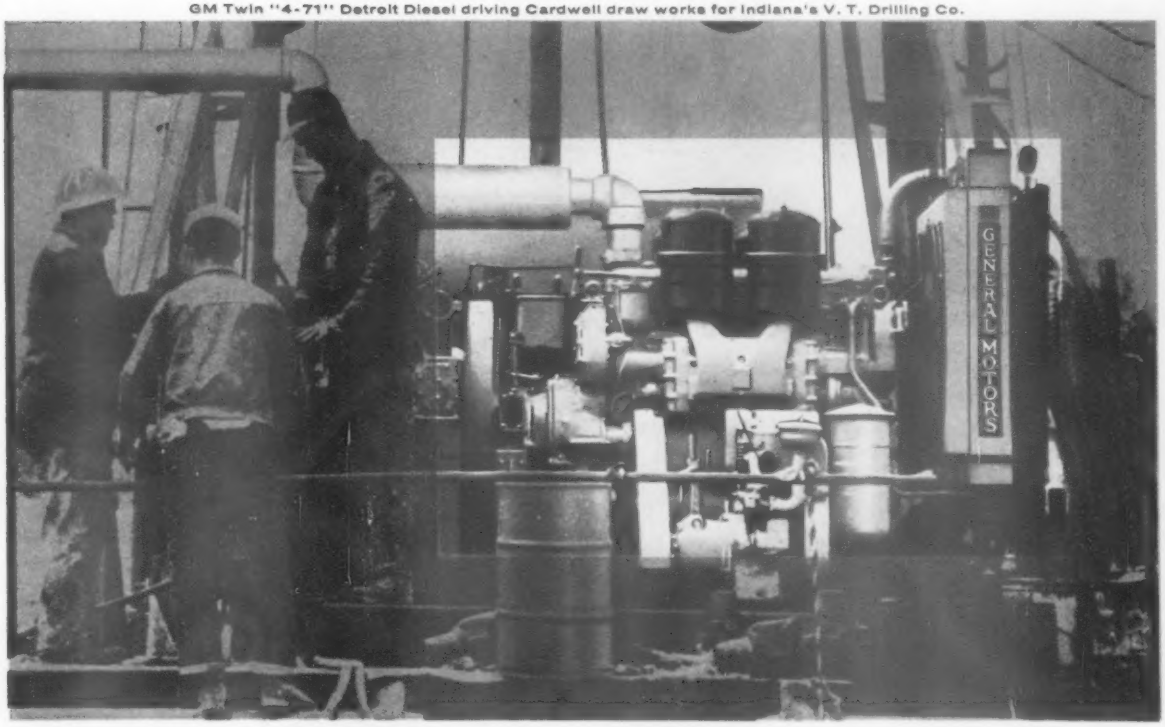
Factory Engineered Parts—
Factory Trained Servicemen Everywhere

GM Twin "4-71" Detroit Diesel driving Cardwell draw works for Indiana's V. T. Drilling Co.



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result of an engineer's good common sense

Pre-fabrication saves time, space and money when B&W Seamless Welding Fittings are used!

The engineer on this job knows his business. He specified B&W Seamless Welding Fittings and arranged for pre-fabrication. Think of the time, space and money he's saving management.

And there's no question of the pre-fabricated sections fitting when they're ready to be installed, because they're dimensionally accurate. Full radius, true circularity and smooth walls of exact thickness permit fast alignment and easy fit-up.

This time, specify B&W Seamless Welding Fittings for a permanent, leakproof piping system. Seamless Welding Fittings allow piping to nest closer, are stronger, yet weigh considerably less than other types of fittings. They're available in a complete range of sizes and types in carbon and the B&W CROLOYS.

THE *NATURAL* SOURCE FOR ALLOY FITTINGS

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TUBULAR PRODUCTS DIVISION

FA-7905-FE

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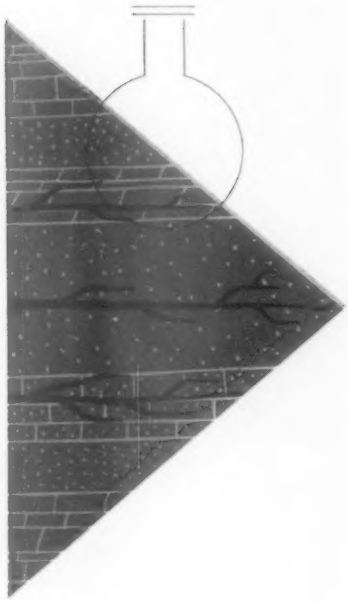
Seamless welding fittings and forged steel flanges, seamless and welded tubular products — in carbon, alloy and stainless steels.

acidize and fracture
in
one
operation

WITH
HALLIBURTON'S
Acidfrac



TWO-IN-ONE PROCESS

When limestone is present, chemical and fracturing treatments are combined in Halliburton's Acidfrac process...a tailor-made acid-in-oil emulsion engineered to increase your oil and gas production.

FARTHER EFFECTIVE PENETRATION

Acidfrac's delayed acid action provides deeper chemical penetration . . . can be forced farther into the reservoir for extended effectiveness. Acidfrac's emulsion breaks clean too . . . with reaction, time and temperature.

COMBINATION TREATMENT

Acidfrac emulsion is an efficient sand carrier. The combined chemical and mechanical fracturing action team up to give you beneficial results in many cases where conventional acid or fracturing treatments fail.

To aid in reviving recovery from limestone, dolomite or limey sand formations, use Halliburton's double-acting Acidfrac process. Call the local or district office or write the Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

Ask for "Elements of Hydraulic Fracturing" brochure.

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251 SERVICE CENTERS—
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NEW!

TUBE-TURN® "TAPER FACE" FLANGE

...cuts cost of light-duty piping

...protects low pressure pumps and valves

Tube Turns announces a new lightweight welding neck flange for service up to 125 lbs. W.O.G. pressure, offering two important cost-cutting advantages: (1) It is priced lower than conventional flanges. (2) This lightweight welding neck flange has a tapered face which affords an effective seal with reduced bolt loading; hence, permits use of steel butt welding neck flanges without danger of cracking the flat faced cast iron flanges of valves and pumps used in low pressure piping systems. Here is another result of Tube Turns pioneering research, and an example of how you get *more for your money* when you specify TUBE-TURN Welding Fittings and Flanges and buy them from your nearby Tube Turns' Distributor.

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HOW TO SAVE

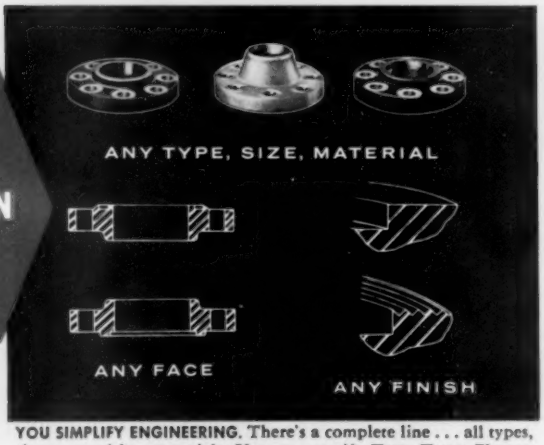
How you cut costs with
TUBE-TURN FLANGES

with the **NEW** Taper Face Flanges

CUTS FLANGE COSTS. For many applications of light-duty piping . . . up to 125 lb. W.O.G. pressure . . . the new TUBE-TURN Taper Face Flange gives rated performance at a lower price than conventional designs. Here's a good teammate for lightweight pipe and fittings in applications such as water, oil and gas distribution . . . on pumps and compressors . . . any installation where welded piping must be flanged to low pressure valves, pumps or equipment.

PROTECTS VALVES AND PUMPS. Lightweight and tapered face permit good seals with reduced bolt-loading on valve or pump flanges. Lighter, lower-priced valves can be used without danger of cracking their flat faced cast iron flanges. Also, lighter neck of flange speeds up welding to pipe.

with all **TUBE-TURN** Flanges



YOU SIMPLIFY ENGINEERING. There's a complete line . . . all types, sizes, capacities, materials. You can specify TUBE-TURN Flanges and know you'll get the exact answer to your problem. Also, Tube Turns offers you engineering help.

YOU STREAMLINE PURCHASING. Your nearby Tube Turns' Distributor provides complete-line service. This one source for all your needs in welding fittings and flanges enables you to put *all* your requirements on *one* order . . . to cut red tape, save valuable time.

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The New line of Taper Face Flanges is described in this Tube Turns booklet . . . free on request.

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Here's your "Task Force" for any type of fire

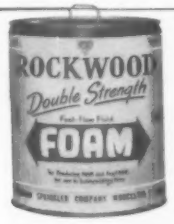
Complete team of Rockwood portable products combines speed, versatility and economy

Separately, each of these Rockwood products has its own particular advantages for fighting various types of fires. Together, they make a mobile, multi-purpose task force that delivers a whale of a lot of protection against *any* type of fire, whether it's Class A (wood, paper, rags, etc.), or Class B (flammable liquids). That includes personnel protection, too, because safety for the men who use them is an essential factor in all Rockwood fire fighting products.

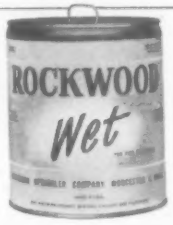
Rockwood's long, practical experience and constant research bring you not only new *efficiency* but new *economy* in fire-fighting methods and equipment. It will pay you to learn more about these and many other Rockwood products. Mail the coupon today for complete information on Rockwood's specialized fire-fighting products.

* **Type SG-60 Nozzle.** A true all-purpose nozzle that fights fire 5 ways. It discharges high velocity WaterFOG, low velocity WaterFOG (with applicator), FogFOAM, solid stream of water or solid stream of FOAM.

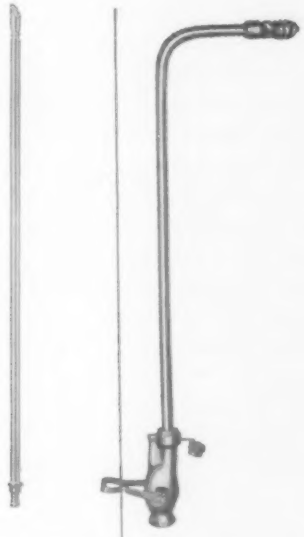
FOAM and "Wet" Eductor with the new FW Metering-Check Valve. Introduces Rockwood FOAM or "Wet" into hose lines, automatically proportioning correct amount of FOAM and "Wet" to water. Also usable wherever one liquid is fed into another on a fixed percentage basis.



* **Rockwood Double Strength FOAM.** Puts out fires in flammable liquids, and in ordinary combustibles, quicker, at lower cost. Three parts FOAM and 97 parts water create a tremendous heat-resistant blanket. Flows freely at —15°F.



* **Rockwood WET.** One part WET mixed with 99 parts water increases water's penetration and extinguishing action. Gives quickest results against deep seated fires. Saves time, water, manpower.



Bayonet Piercing Applicator. Has a hardened steel cutting tool attached to tip, enabling operator to pierce through partitions, into interiors, etc. Discharges low velocity WaterFOG or FogFOAM.

* **Long Extension Applicator.** Discharges low velocity WaterFOG in an umbrella pattern, smothering fire without causing turbulence to flammables. Excellent personnel protection is another advantage.

FF Extension Unit. Shown with Type SG-60 Nozzle. Discharges Rockwood FOAM in a solid stream or as FogFOAM. Wide angle makes it possible to cover large areas at one time.

**NOTE: The products shown here have all been Tested and Listed by Underwriters' Laboratories, Inc.*

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Engineers Water . . . to Cut Fire Losses

ROCKWOOD SPRINKLER COMPANY
Portable Fire Protection Division
1588 Harlow Street
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Please send me your illustrated booklet on Rockwood fire-fighting products.

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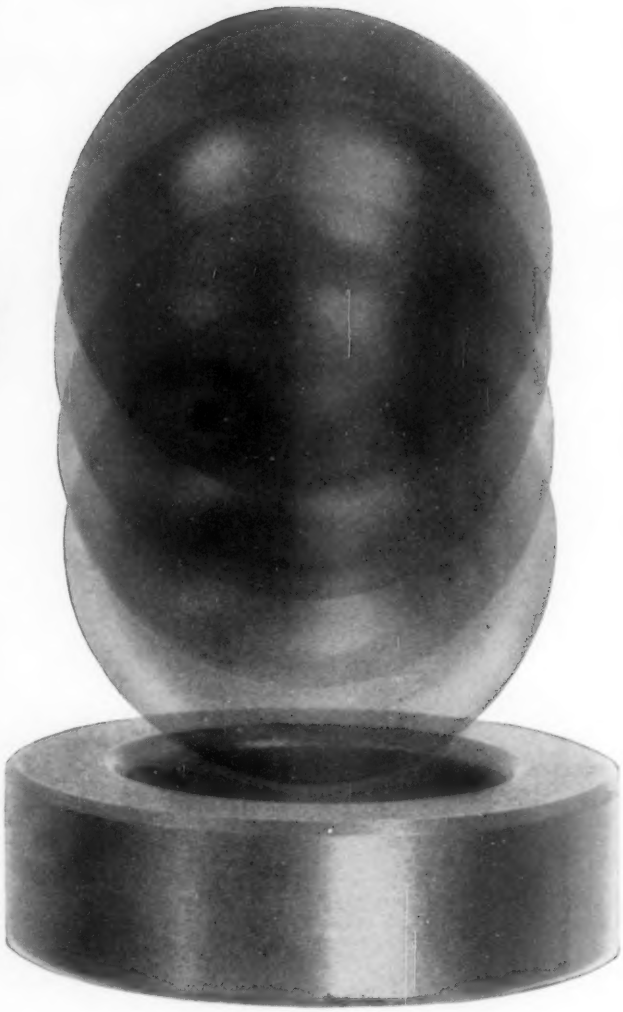
Install it... then forget it!



Ball and seat of Kennametal* or Kentanium* stays *down* longer . . . cuts well downtime . . . keeps production high . . . profits *up*.

High hardness . . . extremely high resistance to wear, to corrosion, and to deformation under impact . . . Kennametal Balls and Seats stay on the job from 3 to 5 times longer than "special" or "super" alloys . . . 20 times the service of steel . . . even under the most severe conditions of ball pounding, ball-on-seat impact, sand abrasion, or acid corrosion. More oil is moved up . . . at a faster rate . . . and with fewer pump pulls, less oil well downtime. Pump repair and maintenance costs are cut.

Two grades are available. Kennametal grade KH is for use under high abrasive cutting conditions. Kentanium is recommended for use in applications where severe cage wear, corrosive sand, sulfide fluids, and seat impact are met. Kentanium, being one-third lighter than steel, greatly reduces ball-on-seat shock.

It will pay you to use Kennametal or Kentanium balls and seats to combat wear, impact failure and corrosion in your operations. For further information, contact your regular supplier, or write KENNAMETAL INC., Dept. OG, Latrobe, Pennsylvania.

*Trademarks

B-5999

Let it pound away!

A Kennametal Ball and Seat provides exceptionally high resistance to:

. . . fluid cutting	. . . ball pounding
. . . wear	. . . ball-on-seat shock
. . . corrosion	. . . electrolytic action

INDUSTRY AND
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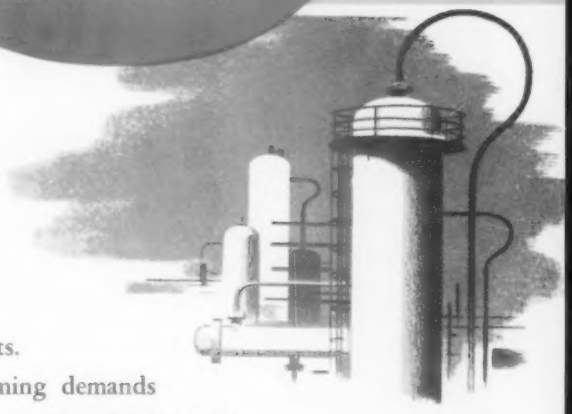
. . . Partners in Progress

Accuracy...

is TRADITIONAL at WESTERN

Accuracy
IS VITAL TO
CATALYTIC REFORMING



Many of our customers employ a catalytic reforming process in the production of premium motor fuels, high yields of aromatic hydrocarbons, or high-quality aviation gasoline components.

Whatever its application, catalytic reforming demands *unerring accuracy* in the heat transfer equipment employed—accuracy in rating—in design—in welding—in complete fabrication.

Western Heat Exchangers meet these demands because Western's rating and design engineering—manufacturing techniques—close attention to detail—are dedicated to *accuracy first.*

Western has successfully participated in the development of many catalytic reforming units now in service throughout the world.

Western's representatives stand ready to serve you . .

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I had maintenance headaches . . .

THIS astute petroleum engineer solved his maintenance problems when he discovered that:

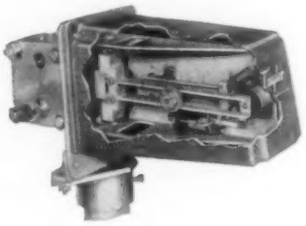
Taylor TRANSAIRE* Transmitters for temperature, pressure and flow need minimum maintenance to give dependable accuracy—continuously—under the most rugged conditions found in the petroleum industry!

Taylor TRANSAIRE Transmitters give more sensitive measuring—faster. Designed in close collaboration with processing engineers, these Transmitters are made to meet today's industrial requirements for precision instruments that practically take care of themselves.

Here are the three members of the TRANSAIRE family that one user called "the perfect prescriptions for maintenance problems." All have weatherproof housings built for tough service and outdoor mounting—all have negligible motion for the least possible wear. Ask your Taylor Field Engineer for full details of these field-proven Taylor TRANSAIRE Transmitters, or write for **Bulletin 98226.** Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.

*Reg. U.S. Pat. Off.

By Taylor TRANSAIRE Differential Pressure Transmitter

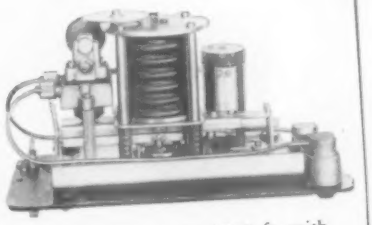


A very versatile flow transmitter, inexpensive and simple to install . . . easy to maintain. Quick, simple range changes for product or seasonal demand changes. Follows flow changes quickly because of low volumetric displacement—no seal pots. Self-draining or venting—no periodic manual venting or draining of lead lines. Overrange protection to full body rating. Easy range suppression. Negligible temperature effect. No leveling—mercuryless dry meter. Simplified piping because it can be close-coupled to orifice flanges.

Taylor Instruments

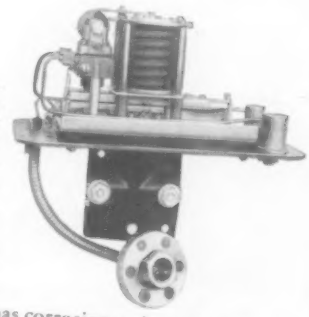
until I found TAYLOR!

Taylor TRANSAIRE Temperature Transmitter



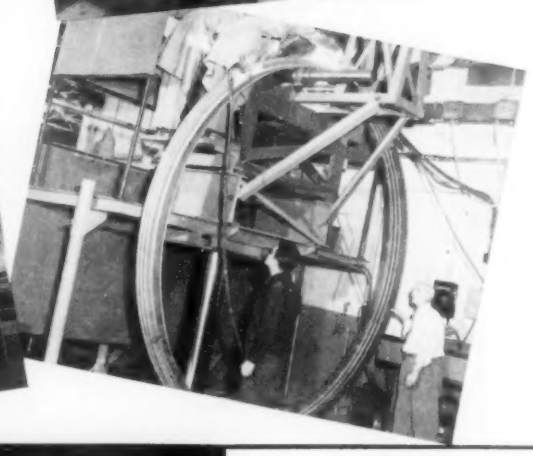
Speed-Act derivative response in measuring circuit gives true dynamic accuracy. This is a compact, super-responsive instrument designed to measure and transmit smallest temperature changes up to 1000 ft. with great accuracy. It will transmit an output pressure proportional to the measured temperature with an accuracy of plus or minus 0.006 psi. Many short range spans within limits of minus 375°F. to plus 1000°F. So simple to maintain that some plants we know have forgotten where they're installed!

Taylor TRANSAIRE Pressure Transmitter



To measure and transmit suppressed pressure changes up to 1000 ft. Accurate to ½% of selected short range span, sensitive to pressure change of ½" water. Short range spans of 20 and 40 psi. throughout range limits of 35 to 415 psia, and 50 and 100 psi. throughout 100 to 1,000 psia. Volumetric type pressure system is extremely accurate, practically clog-proof, has corrosion resistant 316 stainless steel diaphragm. Temperature and barometric compensation for higher accuracy of measurement and control.

MEAN ACCURACY FIRST



Highest quality expansion joints

Quality is built into every Sola-Flex joint. From extensive research and development programs through to precision fabrication, every step guarantees an extra measure of durability and trouble-free service. And Sola-Flex joints are economical—in initial cost and in long life. Send for a Sola-Flex catalog. Dept. C-122, Solar Aircraft Co. San Diego 12, Calif.

SOLA FLEX®

EXPANSION JOINTS AND BELLOWS

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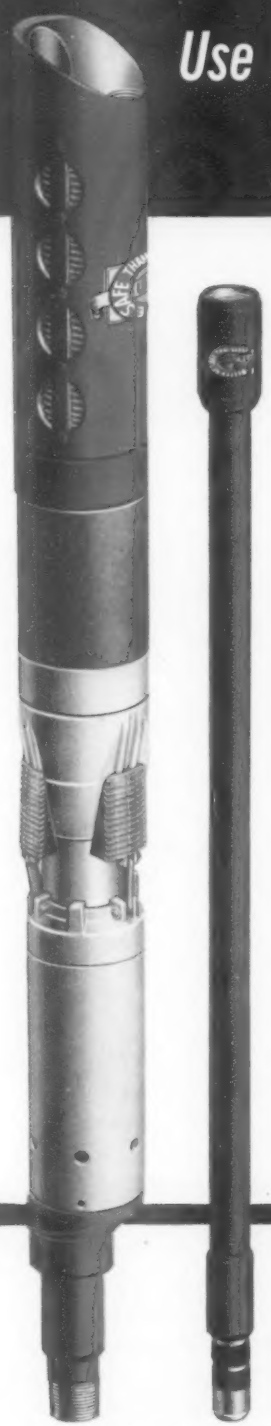
SAN DIEGO DES MOINES

For Dual String Completions – Flowing or Pumping

Use GUIBERSON'S RETRIEVABLE TYPE RD PACKER



Type RD Packer with Anchor and Plain Stinger

This cleanly designed, rugged packer is an outstanding Guiberson development for dual string installations in wells of any depth.

Outstanding in performance because it operates perfectly with both zones flowing, high or low differential pressure; with either zone flowing, the other zone pumping; with both zones pumping; with either or both zones on gas lift; or for multi-zone injection — gas or water.

Outstanding in advantages because it completely isolates each zone from the other and from the casing; provides full opening long string to lower zone; permits either string to be pulled or run separately.

Guiberson's RD packer does complex dual zone jobs so well that operators tell us it's their best investment for dual string production. Ask your Guiberson representative about installation and auxiliary equipment recommendations.

Guiberson's RD packer has smooth operating dovetail slips of heat-treated alloy steel. Packing rubber is one-piece sleeve type — will not vulcanize in the well, made of Guiberson's special oil and gas resistant compound. You can get the RD packer with or without anchor, and a choice of stingers, plain or with jay-hook. Piston slips have extra large gripping area, are heat-treated alloy steel and keyed to anchor body to maintain proper alignment. Get the Best — Get Guiberson.

THE GUIBERSON CORPORATION

ESTABLISHED 1919
DALLAS, TEXAS
U. S. A.

Sold by
Oil Field Supply Stores
Everywhere

do you want low-cost corrosion or contamination

Acetone • Borax • Calcium Carbide • Calcium Carbonate • Calcium Chloride (Flake) • Ethyl Acetate • Ethyl Alcohol • Ethylene Glycol • Glycerine • Insecticide Concentrates • Soap and Soap Lye • Soda Ash • Sodium Bicarbonate • Sodium Silicate •

CF&I

LECTRO-CLAD* Trademark

Nickel Plated Steel Plates will give it to you

Yes, you can get low-cost, yet effective protection against contamination and corrosion with all these chemicals...and many more!

Effective in heavy industrial applications where the corrosion rate does not exceed 0.0015 inches per year, CF&I LECTRO-CLAD Nickel Plated Steel Plates successfully combine the corrosion and contamination resistance of nickel and the economy and strength of carbon steel.

That's because CF&I LECTRO-CLAD is made by the Bart Process, which consists of electrodepositing a heavy layer of 99% pure nickel on a carbon steel plate. This process results in a permanent bond between the nickel and the steel base. The nickel plating is customarily supplied in the 8-10 mil range; however, it can be plated up to 15-20 mils, if specified.

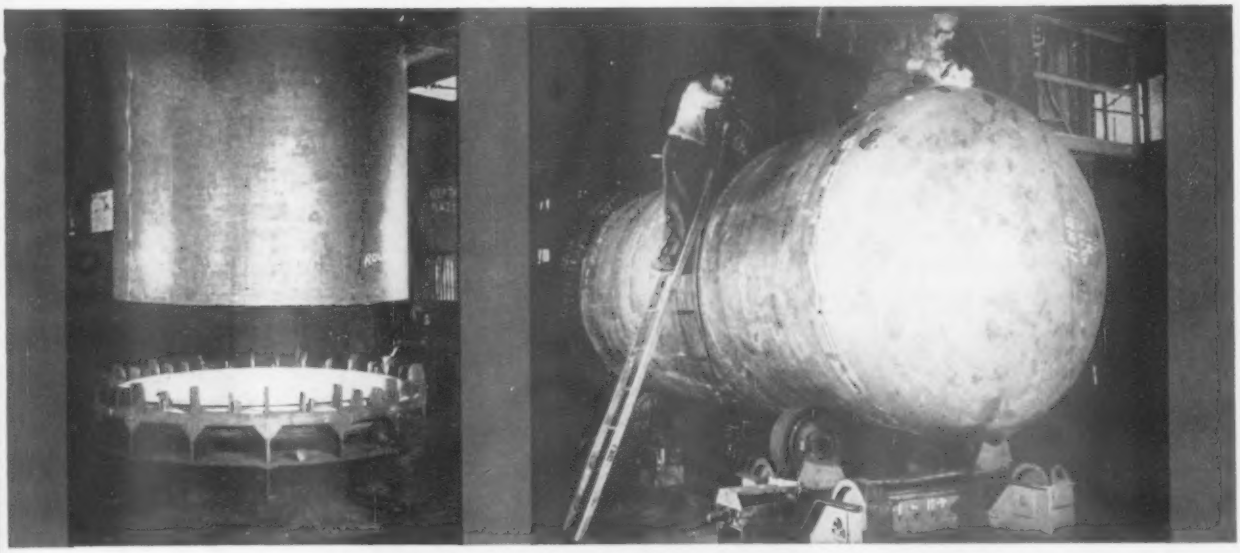
What's more, CF&I LECTRO-CLAD Nickel Plated Steel Plates are easily fabricated without costly special equipment. Just use regular shop equipment and bend it... weld it... roll it—the protective nickel layer will not check, spall or flake!

Ask our nearest sales office for the complete story on economical, effective, easy-to-fabricate CF&I LECTRO-CLAD Nickel Plated Steel Plate today. Wickwire Spencer Steel Division, The Colorado Fuel and Iron Corporation, P. O. Box 1951, Wilmington, Delaware.

***NICKEL PLATED BY THE BART LECTRO-CLAD PROCESS**

protection against with these chemicals?

Caustic Soda • Chlorinated Hydrocarbons • Cold Hydrofluoric Acid • Dibutyl Phthalate
Methyl Alcohol • Petroleum Catalysts • Phenol • Potash • Resin Plasticizers • Salt
Sodium Sulphate • Titanium Dioxide • Tricresyl Phosphate



Assembling a tank fabricated from CF&I LECTRO-CLAD Nickel Plated Steel Plates.

0798

Claymont Steel Products

Products of Wickwire Spencer Steel Division • The Colorado Fuel and Iron Corporation

CF&I

Albuquerque • Amarillo • Atlanta • Billings • Boise • Boston • Buffalo • Butte • Casper • Chicago • Denver • Detroit • El Paso • Ft. Worth • Houston • Lincoln (Neb.) • Los Angeles
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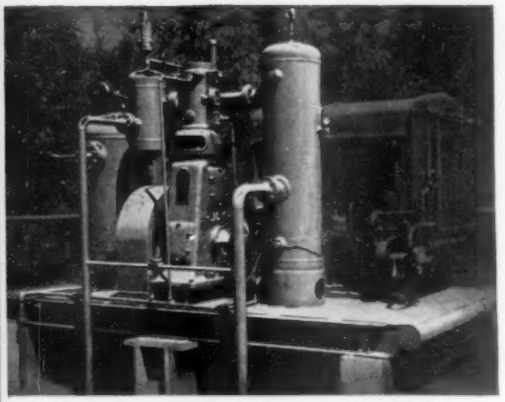
CF&I OFFICES IN CANADA: Montreal • Toronto CANADIAN REPRESENTATIVES AT: Edmonton • Calgary • Vancouver • Winnipeg

OTHER CLAYMONT PRODUCTS

Stainless-Clad Plates • Manhole Fittings and Covers • Large Diameter Welded Steel Pipe • Fabricated Steel Parts • Flanged and Dished Heads • Alloy Steel Plates • High Strength Low Alloy Steel Plates

THE ONLY MODERN-DESIGN COMPRESSORS FOR GAS BOOSTER OPERATION



Joy WGB-110 Gas Compressor. Inlet pressure 150 psig; Discharge pressure 500 psig. Capacity 1.028 MMCFD. "Packaged" by McNamar Boiler & Tank Co., Tulsa.

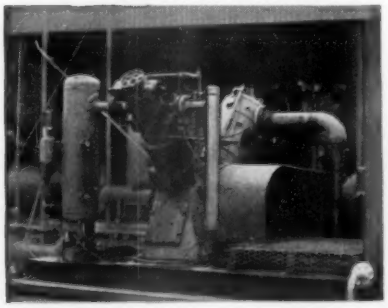
JOY *Packaged* GAS COMPRESSORS

Modern Joy Packaged Gas Compressors are backed by a century-old reputation for low maintenance and long service. These *time-proved* features make Joy Compressors the most reliable for gas gathering, repressuring, or gas lifting:

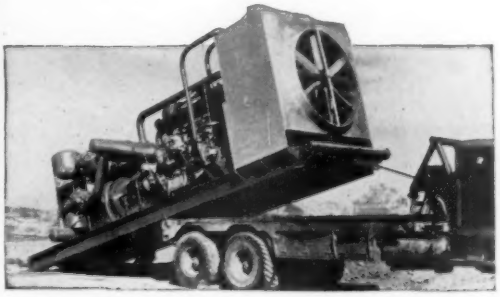
- **Field-replaceable cylinder liners.**
- **Field-replaceable crosshead guides.**
- **Patented Joy "Dual-Cushion" valves.**
- **Full force-feed lubrication.**
- **Anti-friction main bearings.**

Joy Gas Compressors are available in space-saving vertical, V-type, and semi-radial designs . . . single or two-stage units with cylinder sizes from 3″ to 13½″. Four different frame types accommodate a power range of 50 to 400 HP.

For the most efficient compressor for your needs, consult a Joy Engineer or write to ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*



Joy WNB-112 Gas Compressor. Inlet pressure 35 psia; Discharge pressure 665 psia. Capacity .85 MMCFD. "Packaged" by Oil & Gas Supply Company, Houston.



This photo of a Joy WNB-114 Gas Compressor Package being unloaded onto concrete pad clearly illustrates portability of unit. Inlet pressure is 5 psig; Discharge pressure is 150 psig. Capacity 2 MMCFD. "Packaged" by McNamar Boiler & Tank Co., Tulsa.

Write for FREE Bulletin 84-31

Consult a Joy Engineer

FOR PORTABLE ROTARY DRILLS, AIR COMPRESSORS, GAS GATHERING COMPRESSORS, PORTABLE LIGHTING LINES

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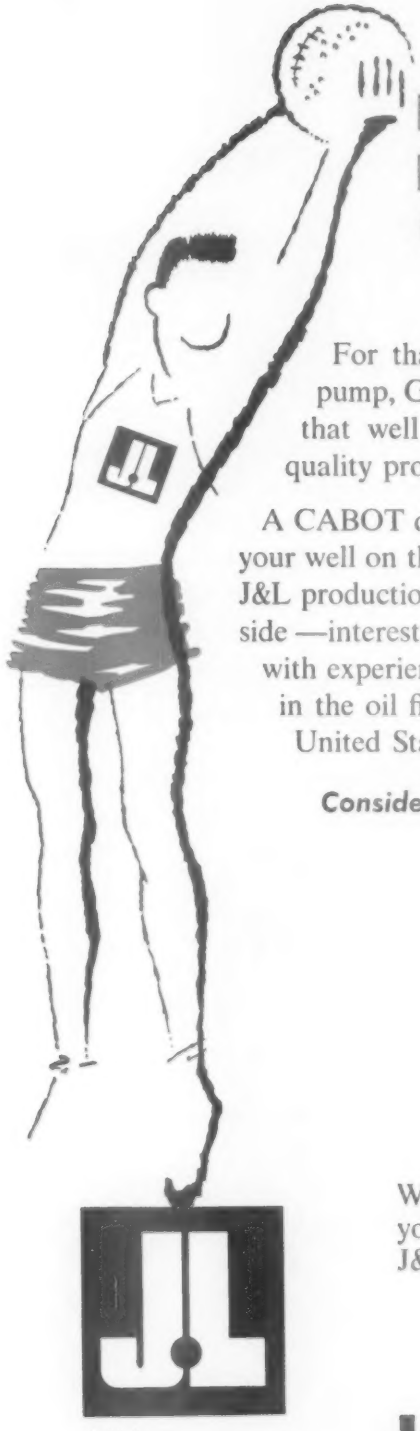
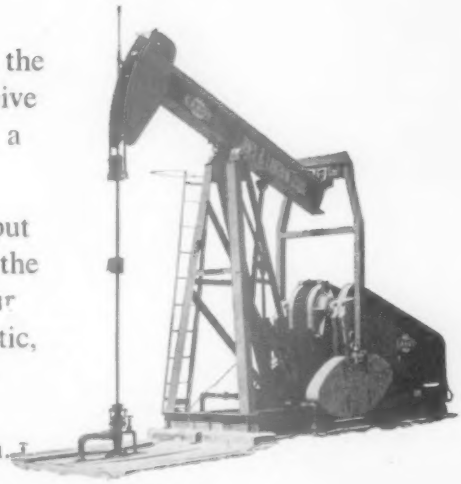
JOY

SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885



PUT J&L ON YOUR PRODUCTION TEAM!

Get a CABOT!



For that next well on the pump, Get a CABOT. Give that well a break using a quality product.

A CABOT does more than put your well on the beam. It gets the J&L production experts on your side —interested and enthusiastic, with experience rooted deep in the oil fields of the United States and Canada.

Consider only a few important FACTS:

1. Unsurpassed quality of material and workmanship.
2. Unexcelled field service.
3. Equalastic (patented) rubber tail bearing.
4. Simple, effective adjustable crank counter balances.
5. Integral low-shaft-center reducers (no oil seals).

We want to be there with a CABOT when your next well goes on the pump — get your J&L store on the telephone now.

4-MA

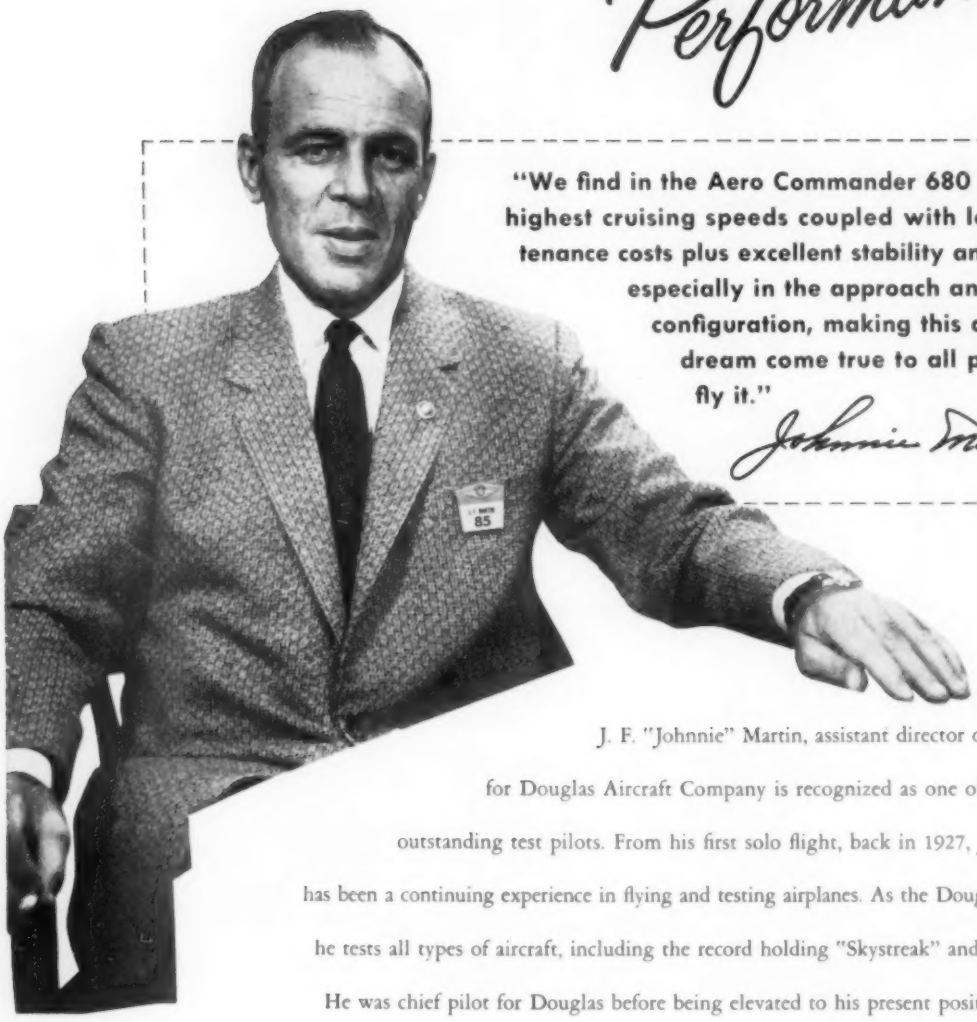
Jones & Laughlin

SUPPLY DIVISION – Tulsa

SERVING THE UNITED STATES AND CANADA

JOHNNIE MARTIN,
ONE OF AMERICA'S
VETERAN TEST PILOTS
SALUTES
COMMANDER 680 SUPER

Performance



"We find in the Aero Commander 680 Super the highest cruising speeds coupled with low maintenance costs plus excellent stability and control, especially in the approach and landing configuration, making this airplane a dream come true to all pilots who fly it."

Johnnie Martin

J. F. "Johnnie" Martin, assistant director of Flight Test for Douglas Aircraft Company is recognized as one of the nation's outstanding test pilots. From his first solo flight, back in 1927, Johnnie's life has been a continuing experience in flying and testing airplanes. As the Douglas test pilot, he tests all types of aircraft, including the record holding "Skystreak" and "Skyrocket." He was chief pilot for Douglas before being elevated to his present position.

AERO *Commander*

For complete information see your nearest Aero Commander distributor or write for Catalog 120-S

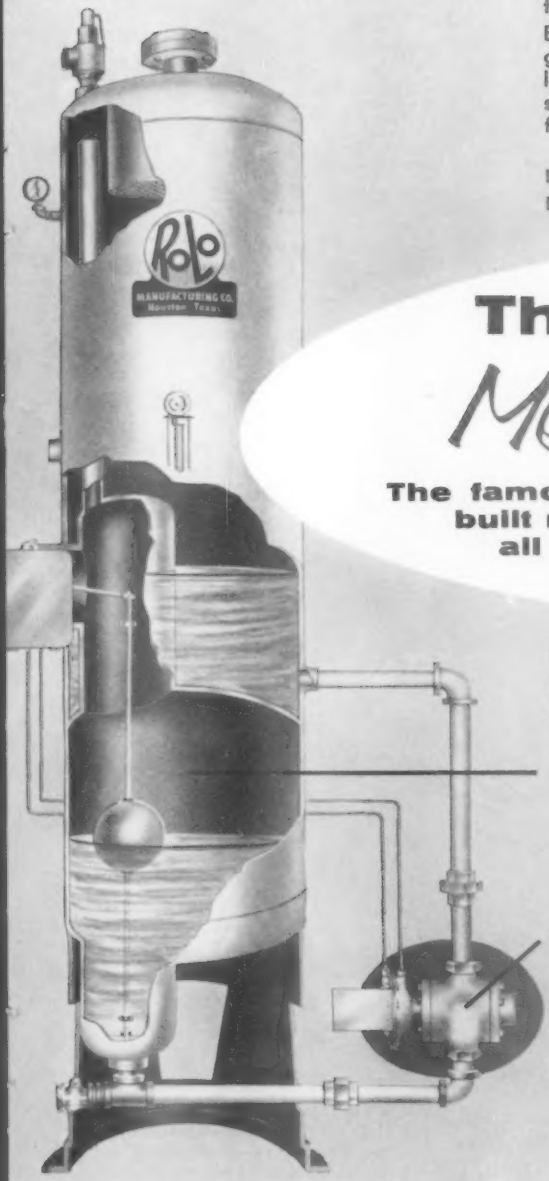
AERO DESIGN & ENGINEERING CO • TULAKES AIRPORT • P.O. BOX 118 • BETHANY, OKLAHOMA

Why it pays to continuously meter the production from each well, individually.....

Continuous separation and metering of oil, water and gas at the wellhead provides the operator with essential information that can be accurately derived in no other way. Continuous metering keeps a **constant** check on a well's production, indicating trouble and the need for treatment **when trouble happens**, not weeks (and dollars) later when noticed in a well test. Continuous, accurate records on individual wells are also invaluable for reservoir studies and future planning.

Besides these advantages, continuous well metering allows great savings in flow lines and tankage; long flow and test lines for individual wells become unnecessary. This means savings in equipment and maintenance, and takes a load off field personnel.

Rolo now offers the unit ideally suited to individual well separating and metering . . .



The ROLOCHECK *Metering Separator*

The famous and proven ROLOCHECK Meter, built right into an efficient separator— all for little more than you'd pay for a separator alone.

The ROLOCHECK Metering Separator automatically separates and meters production **accurately**, with simple and gadget-free efficiency. And ROLOCHECK Metering Separators offer important features exclusive with Rolo:

- **ROLOCHECK METERS** — Field-proven in over a thousand installations. Levels controlled in reduced-area necks, assuring maximum accuracy. Meters alternately fill and dump exactly calibrated volumes. Minimum internals and **simplest control system.** New, rugged counter assures exact counting.
- **ROLO NEUTRAL POSITION 3-WAY VALVES**— These new valves allow only one port (meter inlet or outlet) to be open at one time. At no time, even during the valve-switching operation, can both ports be open at once. Thus, liquid **cannot** bypass the meter!
- **TWO-PHASE AND THREE-PHASE UNITS**— Two-phase units separate total liquid and gas, metering total liquid. Three-phase units have two ROLOCHECK Meters built in, with a free water knockout, so that oil and free water are each metered . . . all this in one vessel. Rolo Automatic Samplers are available for oil lines.
- **ALL SIZES AND WORKING PRESSURES**

Write for information, or contact your nearest representative.

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If you use Chlorine, these manuals are "musts" Write for yours today!

These two excellent manuals were prepared under the careful supervision of Columbia-Southern's technical staff. They provide much valuable knowledge on chlorine, and they're yours without charge. Please use company stationery and send your request to Columbia-Southern Chemical Corporation, Chlorine Department, One Gateway Center, Pittsburgh 22, Pa.

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76 factual illustrated pages on chlorine. Contents cover the history of chlorine, its growth, method of manufacture, handling and unloading, technical data and charts, dozens of other aspects that make this a complete manual on chlorine.

28 pages, illustrated, devoted to safe handling practices. Designed for easy reading by your employees who actually handle chlorine.

SPECIFICATIONS . . . Closing time: 0.1 second
Leakage: 0 Volume flow: over 40,000 s.c.f.m.
Inlet pressure: over 3,000 psig
Temp. range: +400° F. to −300° F.
Size: inlet dia. 2" — outlet dia. 8" — length 18"
Downstream pressure regulated up to 300 psig
Pressure regulation maintained within 1% of setting
Downstream pressure programmed with timing motor

AiResearch valves solve special industrial problems

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Recent scientific and engineering advances have multiplied the needs for valves and controls with critical operating characteristics.

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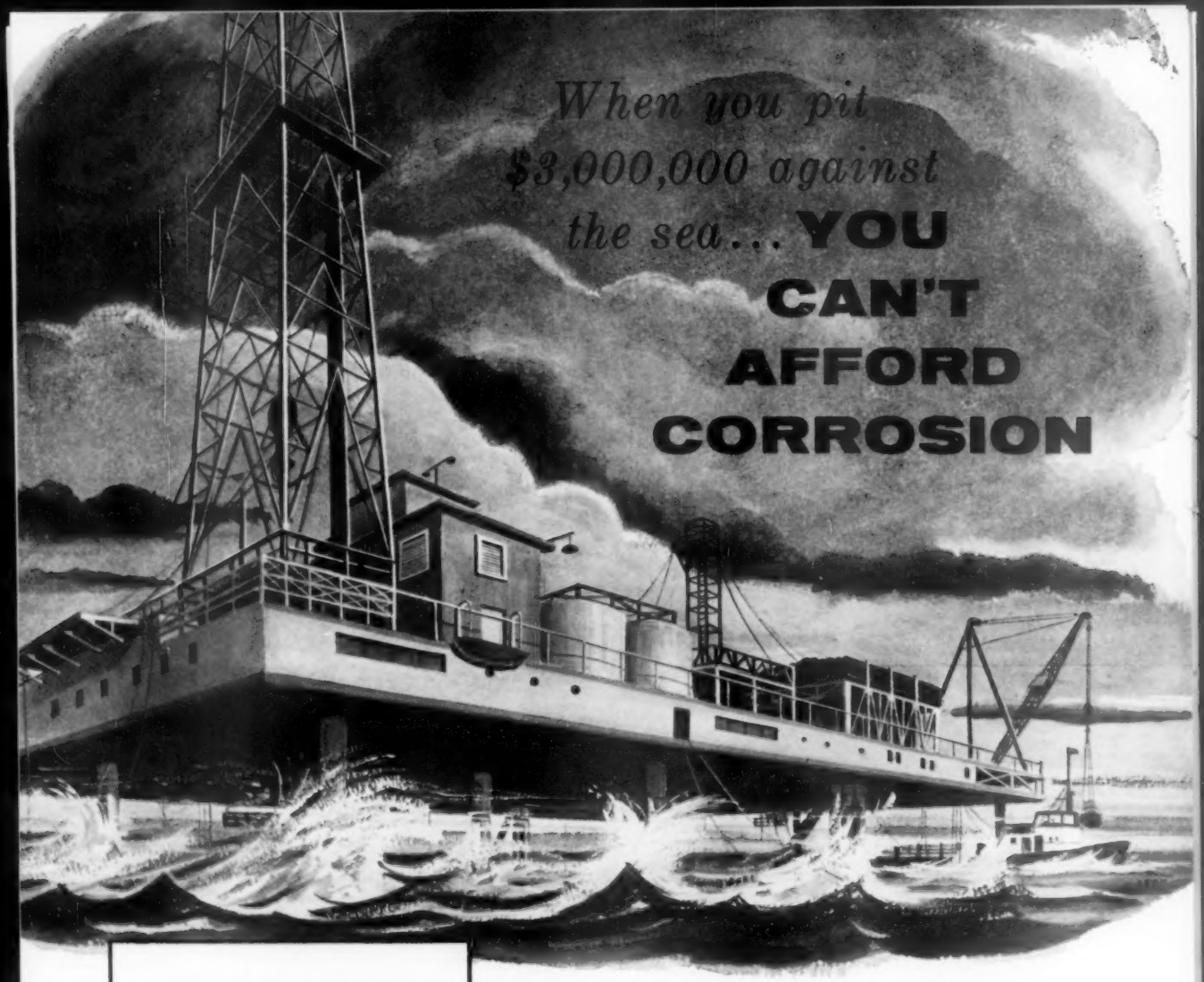
DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS



Stop Corrosion Loss With COPON Coatings

Scientifically Developed for . . .

- **Plant Structures**
- **Production Machinery**
- **Oil or Chemical Storage Tanks**
- **Pipelines—External or Internal**
- **All Types of Vessels**

Out in the Gulf, adequate corrosion control is often the difference between profit and failure. Faced with tremendous odds and skyrocketing equipment costs, operators can't afford to share in industry's annual $8 billion loss to corrosion. So, on rig after rig, they have stopped corrosion with Copon coatings scientifically developed to meet the unusual conditions that exist at offshore locations.

Copon coatings provide matchless protection for costly offshore equipment . . . below the water-line, above the water-line, and in the critical splash area. They adhere tenaciously to metal, form thick films for superior protection of seams, welds and sharp edges, and resist the abrasive action of workboats tied alongside the structures. Subjected to conditions that break down conventional coatings in months, Copon coatings provide years of protection.

Why not use Copon to solve your corrosion problems? A complete technical service is available. Write today for details.

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FOR CORROSION CONTROL

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They Say—

Firm Lowers Finding Costs

"1956 was the first full year's operation of your company in the search for crude oil in our western provinces (of Canada). Some highlights of this program are:

W. HAROLD REA

"1. The addition of over 6,000,000 bbl. of crude-oil reserves acquired with the purchase in 1955 of the assets of Anglo-Canadian Oil. This brings your company's total crude-oil reserves to more than 18,000,000 bbl.

"2. The completion of one of the most successful wildcat drilling programs in the history of the industry. Eleven out of 32 exploratory wells became producers.

"3. An average finding cost of about 38 cents per barrel for oil discovered."

W. Harold Rea, president, Canadian Oil Companies, Ltd., in a statement to shareholders.

Sun President Looks at 1957

"In 1957, it is expected that capital expenditures will exceed those of 1956 by roughly 8 per cent. New records in operations are also predicted, and every company within the industry will face stiff competition just in keeping in step with the pace of progress.

"Sun Oil Co. will continue to spend record sums for expansion and modernization in 1957. Its planning is based on the assumption of a continued high level of economic activity.

"The extension of Sun's multigrade system of marketing gasoline throughout its 19-state marketing territory, new exploration and drilling ventures in the Western Hemisphere, modernization of refining facilities, and normal expansion of company markets account for the largest portion of the expected capital expenditures."

Robert G. Dunlop, president, Sun Oil Co., in a year-end statement.

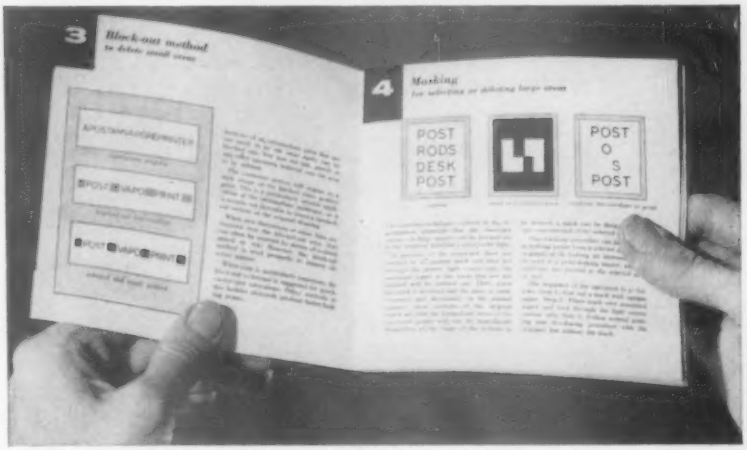
A Pat on the Back

Dear Sir:

I have been observing from time to time articles prepared by W. L. Nelson, all of which have been interesting and informative.

One article especially that is carried in your publication from month

DRAFTING TRENDS



Typical pages from "11 Ways to Save Drafting Time," a booklet on the use of intermediates. Each technique is fully described and illustrated with specific examples.

Helpful booklet on drafting tips offered again

Intermediates can be used in a variety of ways to cut costly retracing, changing and modifying of drawings.

An interesting booklet called "11 Ways to Save Drafting Time" is available without charge to engineers and draftsmen. Published by Frederick Post Company, it compiles the many ways of using *intermediates* to modify drawings without changing the original.

As most draftsmen know, an intermediate is any translucent reproduction master printed from an original drawing. Once the drawing is printed on the intermediate, this "duplicate master" serves as the source for future print making. By modifying only the intermediate and leaving the original unchanged, draftsmen save valuable hours of tracing and redrawing.

The booklet shows 11 specific ways of using intermediates to make changes, each one illustrated with examples. Some of the techniques covered are scissor editing, masking, the block-out method, successive additions and preprinting.

The other methods shown are transparent matte tape, pick-off transfer, composite grouping, composite overlays, non-reproducible blue and use of corrector fluids.

The techniques described apply to various print-making methods such as moist-developed process, ammonia process, blueprint, sepia negative and even reproduction cloths in some instances.

Further information on the new "11 Ways" booklet is available from the Reader Service Division of the Frederick Post Company, 3644 N. Avondale Avenue, Chicago 18.

POST

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For Either Pressure or Immersion Sampling

for testing Natural Gasoline – Benzol Blends – and other liquids not exceeding a vapor pressure of 45 lbs. at 100° F. by the Reid Method.

Construction conforms strictly to A.S.T.M. specifications. Requires no wrench—By means of the "O" ring gasket hand coupling will make a tight seal. Each bomb tested for 200 pounds air pressure.

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UTILIZING TUNGSTEN CARBIDE PARTICLES that continuously renew their cutting edges, new Kinzbach Speedmills offer you faster, surer milling under even rugged down-hole conditions.

Kinzbach Speedmills require less torque for cutting . . . eliminate drill pipe wind-up . . . reduce shock on drilling string . . . are unaffected by heat generated by normal cutting action. The usual close control of speed and weight required in ordinary subsurface cutting operations is not necessary with Kinzbach Speedmills.

Types available for every down-hole milling problem.

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to month, "Cost-imating," is an outstanding article with respect to rising cost trends of construction of pipelines, compressor stations, and crude and natural-gas processing facilities. The cost indexes appearing in "Cost-imating" have proved very helpful to me and I have found the indexes to be recognized by several construction firms.

The volume of work in processing data to arrive at these index trends must have been tremendous and Mr. Nelson should be complimented for this contribution.

I write this letter to you to express my sincere appreciation for having such data available in The Oil and Gas Journal.

Milton F. Shaffer
Oil and Gas Consultant
Amarillo, Tex.

Uninterrupted Steel Output Forecast

"The steel industry enters 1957 at a record-breaking rate of production and there are indications that steel consumption may well set a new record during the next 6 months.

"Had it not been for a 34-day strike in mid-1956, the past year undoubtedly would have established a new production record. Now, with a 3-year, no-strike contract the steel industry may look forward to uninterrupted production in serving its market."

Roger M. Blough, chairman of the board, United States Steel Corp., in a year-end statement.

Dependable Crude for West Coast

". . . National defense planners should carefully weigh the importance of providing the West Coast with an adequate and dependable supply of crude.

"Admittedly, the economics may indicate that the oil should go to the Gulf Coast or other points, but considering the national defense requirements, the West Coast should not be dependent upon imported oil in the case of war, as it is most likely that the use of the seas would be largely restricted. Here is a situation in which the economic desirability of moving oil in one direction should not outweigh the importance to national defense. . .

"Leaders in the petroleum industry repeatedly have warned of the long-range effect of excessive imports, but it remained for the Suez crisis to focus governmental and public attention on the seriousness of this problem as it affected the over-all national defense picture.

"In Texas, this was most vividly demonstrated by the inability of transporters to move more than 18 days

A 6000#/24 hr. capacity W&T chlorinator is used on the central cooling water system at Marcus Hook, Penna. refinery of Sinclair Refining Company.

W & T CHLORINATION . . .

the economical way to prevent slime in cooling waters

Water used for cooling operations at the Marcus Hook refinery of Sinclair Refining Company is chlorinated to prevent slimes from fouling plant units and lowering cooling efficiency.

Chlorination of the system is accomplished by one W&T chlorinator operated from a program control panel. The control automatically starts and stops chlorination in accordance with a preselected schedule. Slime growths are eliminated in the cooling units without the need for continuous treatment.

For information about W&T chlorination for slime elimination write for Bulletin CD-43.

WALLACE & TIERNAN INCORPORATED
25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

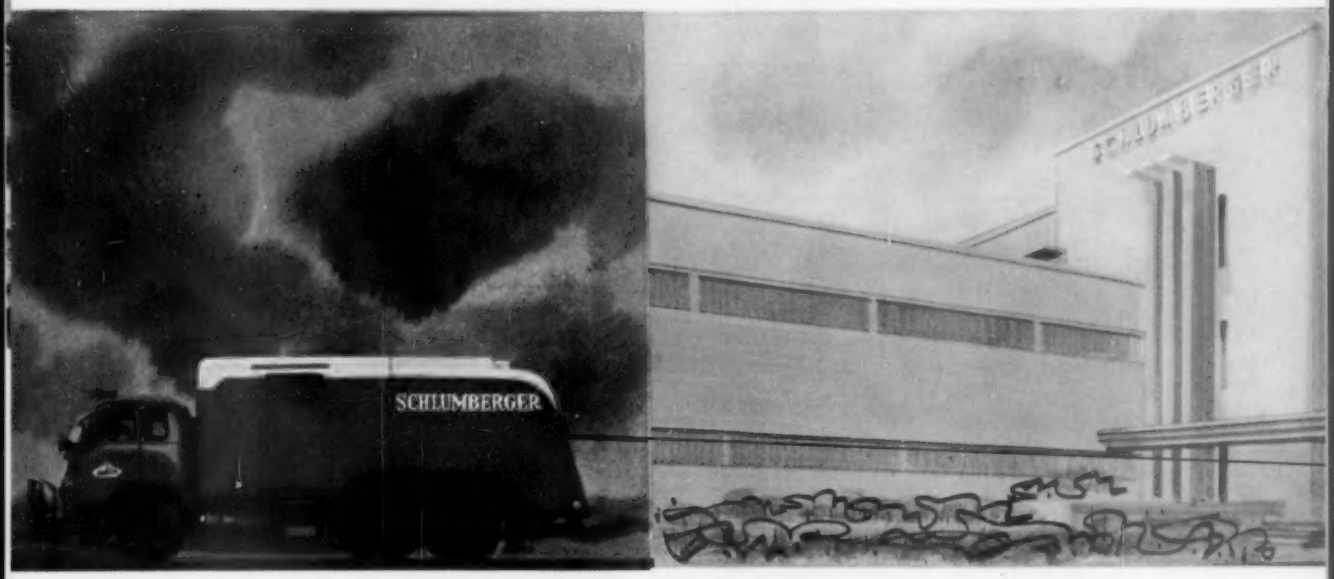
E. R. P. CATHODIC PROTECTION
. . . INDIVIDUALLY DESIGNED FOR EACH APPLICATION
to prevent corrosion of buried or submerged metal structures
Write for Bulletin E-37
E-37

ELECTRO RUST-PROOFING CORPORATION
30 MAIN STREET, BELLEVILLE 9, N. J.

the most surveyed well in the world is right in Schlumberger's "backyard"

It is our specially constructed test well, completed in 1948. Since then, more than 6500 test surveys have been run . . . more than two-a-day every day of the year.

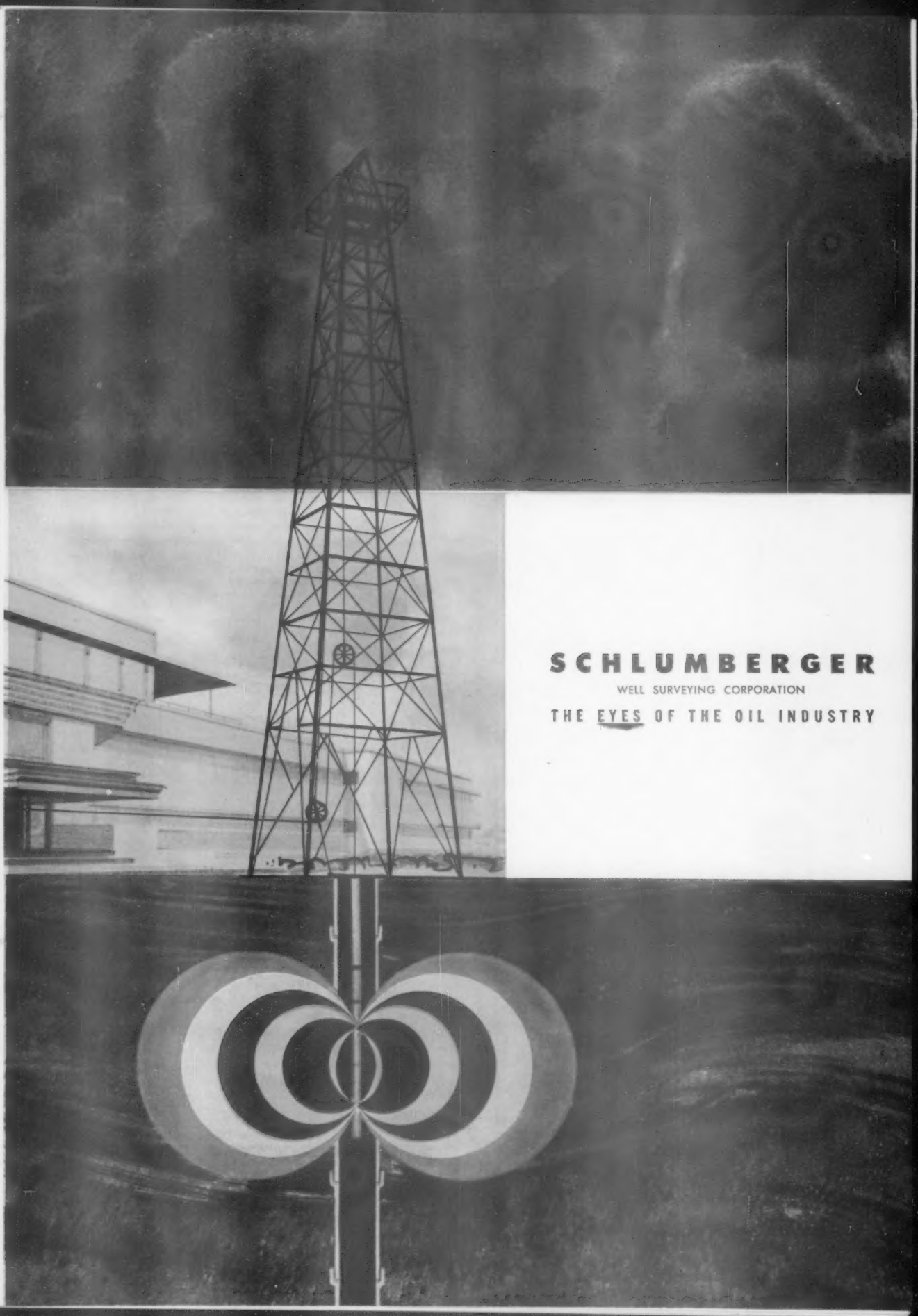
Nearly 800 complete Schlumberger Field and Off-shore Units have logged time at this test well in the past 9 years. It is specially constructed so that the test engineer can run actual down-the-hole surveys. Thorough check-outs are given every Schlumberger instrument control panel and recorder. This has involved the logging of more than 5,200,000 feet of hole.



In combination with this test well and other field simulated conditions in our laboratories, every Schlumberger Field Unit has proved its accuracy and dependability before it rolls up to your well.

The purpose of this exhaustive pre-field testing program, of course, is to insure the very highest quality field performance . . . Schlumberger quality . . . from the very beginning.

Schlumberger . . . to be sure!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THE EYES OF THE OIL INDUSTRY

for simplicity . . dependability . . low maintenance
Specify . . . . . .

VOL-U-METER®

REG. U. S. PAT. OFF.

the accurate oil and water volume meter

PAT. APP. FOR

MODEL 5-CV-01
VOL-U-METER

Specifications are for 125 psi W. P. CV and FV units. Information on other W. P. models available on request.

Field-engineered to make continuous, trouble-free operation, calibration and maintenance as easy as possible, the VOL-U-METER gives dependable, accurate performance at the lowest possible cost. Maintenance cost per unit averages less than $10.00 per year! Operating methods are quickly and easily understood. For dependable, accurate metering units, specify VOL-U-METERS. Available with pneumatic or electrical controls.

FOR USE WITH OIL AND GAS SEPARATORS AND EMULSION TREATERS

WRITE FOR NEW LITERATURE

SPECIFICATIONS AND DIMENSIONS

Sales and service representatives in all major oil fields.

MODEL NUMBERS	2½ CV 01	2½ FV 01	5 CV 01	5 FV 01	10 CV 01	10 FV 01	20 CV 01	20 FV 01	50 CV 01	50 FV 01	100 CV 01	100 FV 01
Volume per Dump, Bbl.	⅛ 500	⅛ 500	⅛ 500	⅛ 500	1.0 720	1.0 720	2.0 1440	2.0 1440	5.0 2000	5.0 2000	10.0 4000	
Rated Metering Capacity, BPD	99.01	99.80	99.22	99.90	99.44	99.95	99.56	99.97	99.75	99.98	99.87	
Avg. Expected Metering Accuracy, Percent											55.00	
A Shell and Base O.D., Inches	16"	18"	20"	24"	24"	24"	30"	30"	38"	38"	38"	
B Length of Dump, Inches	12.62"	17¼"	16.05"	20 23/32"	22.20"	31 3/16"	28.20"	38¾"	49.00"	60 11/32"	60 11/32"	
C Overall Height, Inches, Approx.	35¾"	48"	43⅜"	53"	51½"	64½"	63⅜"	75"	88¾"	98"	98"	
D Center Line Height of Valves	6"	6"	7"	7"	7"	7"	8"	8"	8"	8"	8"	
E Center Line of Unit to Face of Inlet & Outlet Valves, Inches, Approx.	8"	8"	13"	13"	13"	13"	15"	15"	18"	18"	18"	
F Size of Inlet & Outlet Valves, Inches (Standard)	1"	1"	2"	2"	2"	2"	3"	3"	3"	3"	3"	4"
	1"	1"	2"	2"	2"	2"	3"	3"	3"	3"	4"	3"
G Gas Equal. Conn., Inches	28"	35 11/16"	34⅛"	40 19/32"	41¾"	52"	51¾"	62 13/32"	74½"	85⅝"	86⅞"	94¾"
H Height of Upper Liquid Level, Inches												

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Meets Federal Specifications for Chemical Goggles.

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Reverse Circulation

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THE BOWEN JUNK BASKET uses the unique principal of reverse circulation to PULL objects into the basket. Circulating fluid is diverted through side passages in the barrel and against the full circumference of the hole. Here the fluid is deflected, moving all objects toward center. Fluid flows in a continuous stream to the center of the tool and up through the barrel to return ports pulling all objects into the catcher. This reverse circulation action assures more complete recovery of junk in the hole and eliminates misruns. *Full pump pressure can be utilized* because there's no danger of pressure bearing against and causing loss of the fish.

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of production from the major reserves in West Texas to Gulf Coast terminals. The inadequacies of our transportation system are further highlighted by the fact that there are now more than 7,700 wells in the North and West Texas areas alone without pipeline connection, which means that these reserves are not readily available to meet sudden large increases in demand."

E. Bruce Street, president, West Central Texas Oil and Gas Association, in a letter to Defense Mobilizer Arthur S. Flemming, proposing a pipeline between the Four Corners area and the West Texas-New Mexico area.

Prediction for Western Canada

"Western Canada's booming oil and gas industry poured out a record $404-million worth of crude oil and other petroleum products in 1956—an average of $1,122,760 per day—and is looking forward to a New Year that will yield production revenue well in excess of half a billion dollars, to further cinch its place as Canada's No. 1 mineral-producing industry, and the West's No. 2 industry (second only to agriculture).

"Into the West's economy in 1956 the host of members of the oil and gas industry pumped an investment of around $700 millions for exploration, development, land, pipelines, and refineries—far in excess of the former record, set in 1955, of just over half a billion dollars.

"In 1957 over-all investment should come close to the 1956 record, with gas and oil pipeline construction helping offset some curtailment in expected exploration and development spendings."

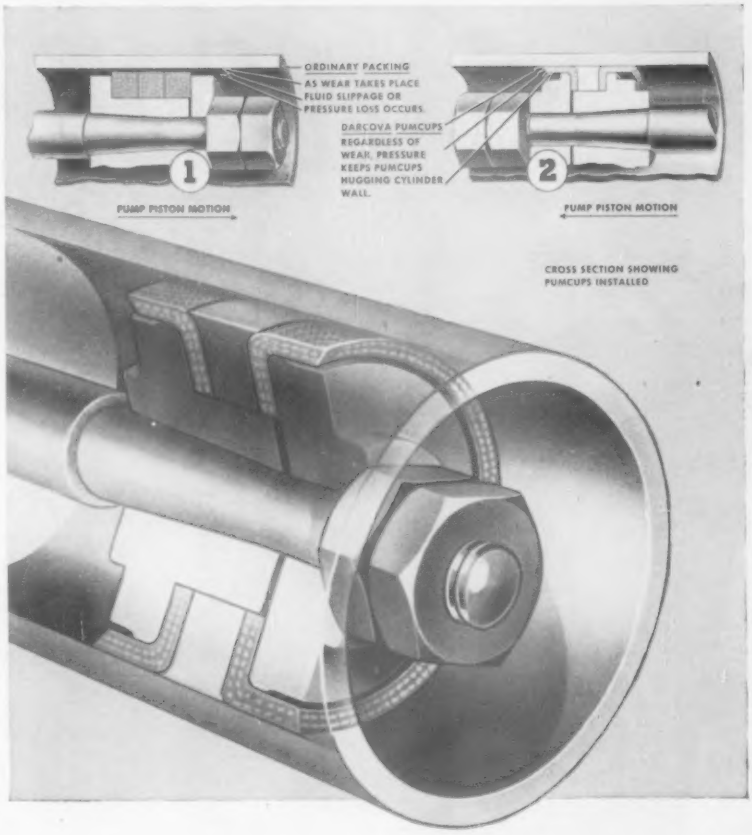
Carl O. Nickle, member of Parliament for South Calgary, in an article in the Calgary Herald.

The Forgotten Man?

"Oil suppiles in the U. S. have been a primary force enabling progress toward peaceful settlement of the Middle Eastern difficulties. Because of our abundance of oil, we did not have to submit to the demands of foreign governments or resort to war. We need not have to in the future.

"By its performance, the domestic petroleum industry has demonstrated that we can continue to have adequate oil for other emergencies in the forseeable future. Developments in 1956, however, have shown clearly that to do this will require a government policy which will limit petroleum imports below the excessive levels which existed prior to the Suez dispute.

"In the critical developments resulting from the reduced flow of Mid-



DARCOVA PUMCUPS mean EFFICIENCY to cost-minded engineers!

IN air and hydraulic cylinders and reciprocating pumps Darcova Pumcups actually retain full efficiency *throughout* their life span . . . and they outlast most other packings at least 3 to 1!

Special texture engineering plus the Darcova Pumcup principle makes it possible for Pumcups to hold their peak volumetric efficiency. Moreover, Pumcups permit equipment to be operated at reduced speeds, save power, prolong equipment life and eliminate the need for frequent replacement shutdowns.

For less maintenance and lower operating costs find out more about Darcova Pumcups. Write for Bulletin No. 4502 on Pumcups for air or hydraulic mechanisms, Bulletin No. 4401 on Pumcups for reciprocating pumps.

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THE ORIGINAL COMPOSITION CUP
PUMCUPS

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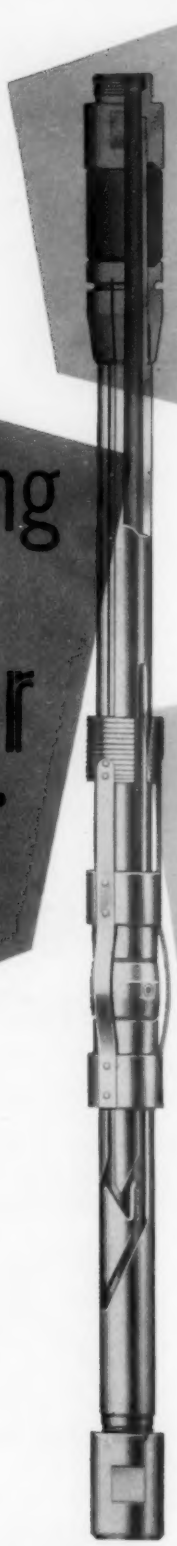
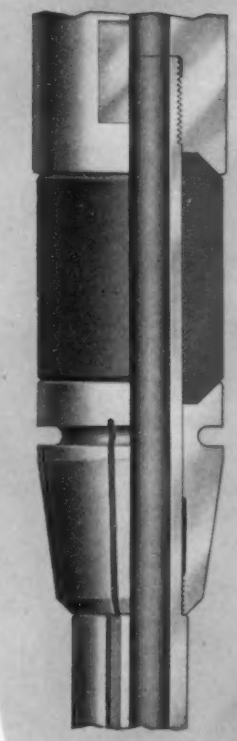
oilmaster

INSERT PUMP ANCHOR



The only tool designed to anchor an insert pump at any point in the tubing without rotation – plus an unique split cone design, internally wickered to provide a positive initial hold-down with a compression packoff rubber – a combination assuring:

1. *A positive seal even in worn or pitted tubing.*
2. *An anchor that can be set and reset on running in without damaging rubber.*
3. *A positive hold-down, even when well flows through pump.*



oilmaster PUMPS

FOREMOST IN THE INDUSTRY

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Main Office and Plant, Los Nietos, California

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dle East oil, the domestic oil producer has become the man of the hour. I hope he does not become the forgotten man when the normal flow of oil from the vast Middle East fields is again restored.

"There are implications to the present crisis which illustrate the need for prompt action now to restrain future imports. Emphasis is being placed on expansion of the number and capacity of ocean-going oil tankers. Also, because of the Suez experience, there unquestionably will be growing tendencies to produce and sell all the oil possible from concessions in unstable areas of the world. These developments will cause greater pressures to increase future imports from the vast Middle Eastern fields, unless positive government limitations are implemented."

Robert L. Wood, president, Independent Petroleum Association of America, in a year-end statement.

CALENDAR

JANUARY

23-24 Northwest Petroleum Association. Nicollet Hotel, Minneapolis.

23-25 Instrumentation for the Process Industries, sponsored by Texas A. & M. College, chemical engineering department, College Station, Tex.

25-26 American Association of Petroleum Landmen, directors meeting, Hilton Hotel, San Antonio, Tex.

31-Feb. 1 Annual instrument short course of Southern California Meter Association, Los Angeles Harbor Junior College, Wilmington, Calif.

FEBRUARY

4-8 American Society for Testing Materials, annual committee week and spring meeting, Benjamin Franklin Hotel, Philadelphia.

6 Petroleum Equipment Suppliers Association, Pacific district spring meeting, Ambassador Hotel, Los Angeles.

7-8 Western Petroleum Refiners Association, Gulf Coast regional technical-industrial relations meeting, Lamar Hotel, Houston.

8-9 American Society for Testing Materials, Symposium on composition of petroleum, Jung Hotel, New Orleans.

13-15 National Association of Corrosion Engineers, Tulsa section, eighth annual short course for pipeliners, Hotel Mayo, Tulsa.

15-16 National Society of Professional Engineers, spring meeting, Hotel Francis Marion, Charleston, S. C.

17-18 Engineers, Joint Council, Statler Hotel, New York.

21-22 Chemical Institute of Canada, eleventh division conference, protective coatings division, Seaway Hotel, Toronto, February 21, and Ritz Carlton Hotel, Montreal, February 22.

22 Natural Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

24-28 American Institute of Mining, Metallurgical and Petroleum Engineers, annual meeting, Hotels Roosevelt and Jung, New Orleans.

25-27 American Association of Petroleum

Photo—Courtesy of Barrett Division—Allied Chemical and Dye Corporation

GOOD MANAGEMENT Recognizes the Value of GOOD TANK EQUIPMENT

A glance at the above photo of the Philadelphia plant of the Barrett Division of the Allied Chemical & Dye Corporation reveals dozens of storage tanks equipped with "Varec" Conservation Vent Units, Pressure and Vacuum Relief Manhole Covers, and Automatic Tank Gauges.

Here is practical evidence of the important role "Varec" storage tank equipment plays in the industrial scene. "Varec" Figure No. 5800 Series Conservation Vent Unit affords the greatest protection for venting inflammable liquid storage. Flame Arrester, Figure No. 50, is listed by Underwriters' Laboratories for use on oil storage tanks and approved by Associated Factory Mutual Laboratories for use on chemical storage.

"Varec" Figure No. 2500 Series, Automatic Tank Gauge, furnishes accurate liquid level gauging to plus or minus ⅛ inch. These gauges can be mounted with "Varec" PULSE CODE Transmitters to convert to a "Varec" PULSE CODE Telemetering System. This provides for remoting liquid level, temperature, motor valve or other equipment status, abnormal or alarm conditions and other data as required. Contactor units to supply "on - off" remote control of equipment such as pumps, motor-driven valves, etc., are available.

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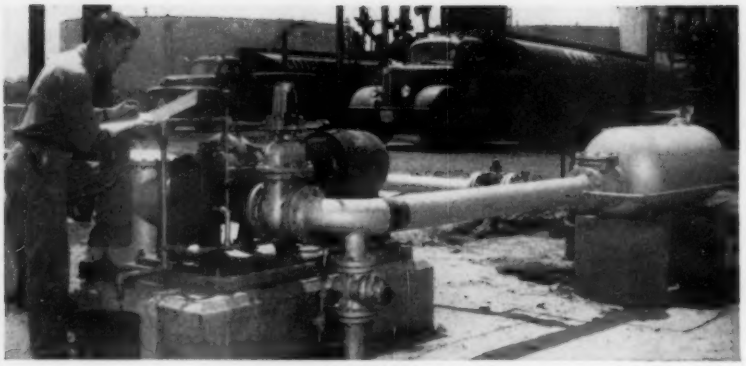
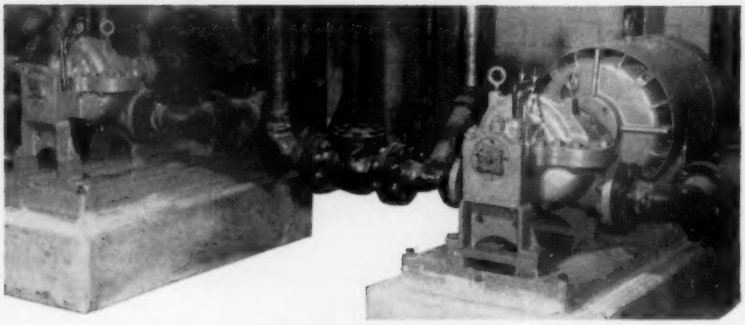


They needed pumping capacity



They needed pumping pressure

You can have capacity . . . or pressure . . . or both

You can meet an exceptionally wide range of pumping needs with just two types of Goulds pumps.

For volume pumping—33 sizes of the Fig. 3405 single-stage, double-suction pump provide capacities up to 6400 GPM, heads up to 425 ft.

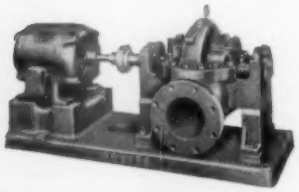
For great pressure—5 sizes of the Fig. 3305 two-stage pump provide heads up to 1000 ft., capacities to 1200 GPM.

All these *extra* features are *standard* on both groups:

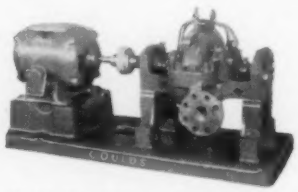
1. Bearing housings sealed against dust and moisture.
2. Renewable stuffing box bushings.
3. Die-formed stuffing box packing.
4. Cowl-type glands for use with quenching fluids.
5. Corrosion resistant gland bolts.
6. Stainless steel impeller rings.
7. Teflon water seal rings.

Because so many parts on these pumps are interchangeable—you can cut parts inventory in two or better.

For further information write for Bulletin 721.6 on the Fig. 3405; Bulletin 722.6 on the Fig. 3305.



Goulds Fig. 3405 single-stage pump.



Goulds Fig. 3305 two-stage pump.

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Geologists, Rocky Mountain section, Rainbow Randevu, Salt Lake City.

27-28 Gas Conditioning Institute, sponsored by the University of Kansas extension, Southwest Kansas Center, Randall's, Liberal, Kans.

MARCH

3-6 American Institute of Chemical Engineers, regional meeting, the Greenbrier, White Sulphur Springs, W. Va.

6-8 American Petroleum Institute, Southwestern district production division meeting, Statler-Hilton Hotel, Dallas.

8 Ohio Oil and Gas Association, winter meeting, Deshler-Hilton Hotel, Columbus, Ohio.

11-15 American Institute of Chemical Engineers, regional meeting, Philadelphia.

11-15 National Association of Corrosion Engineers, Kiel Auditorium, St. Louis.

11-21 Quality Control by Statistical Methods, tenth annual short course, sponsored by University of Illinois, College of Engineering and Division of Engineering Extension, Champaign, Ill.

12-13 Subsurface Geology Symposium, fifth annual conference, sponsored by the University of Oklahoma, Norman, Okla.

13-15 Society of Exploration Geophysicists, tenth annual mid-western meeting, Hotel Texas, Fort Worth.

20-22 American Petroleum Institute, southern district production division meeting, Washington-Youree and Captain Shreve Hotels, Shreveport, La.

25-27 Western Petroleum Refiners Association, annual meeting, Hilton Plaza Hotel, San Antonio, Tex.

25-29 American Society for Metals, Western Metal Exposition and Congress, Ambassador Hotel and Pan-Pacific Auditorium, Los Angeles.

27-29 American Power Conference, Sherman Hotel, Chicago.

APRIL

1-4 American Association of Petroleum Geologists, national convention, Kiel Auditorium, St. Louis.

2-4 Corrosion Control, fourth annual conference, sponsored by National Association of Corrosion Engineers and the University of Oklahoma College of Engineering, University of Oklahoma, Norman, Okla.

7-10 Petroleum Equipment Suppliers Association, annual convention, Palm Springs, Calif.

7-12 American Chemical Society, national meeting, Miami, Fla.

8-10 American Society of Mechanical Engineers, spring meeting, Dinkler-Tutwiler Hotel, Birmingham, Ala.

9-11 American Welding Society, fifth annual welding show, Convention Hall, Philadelphia.

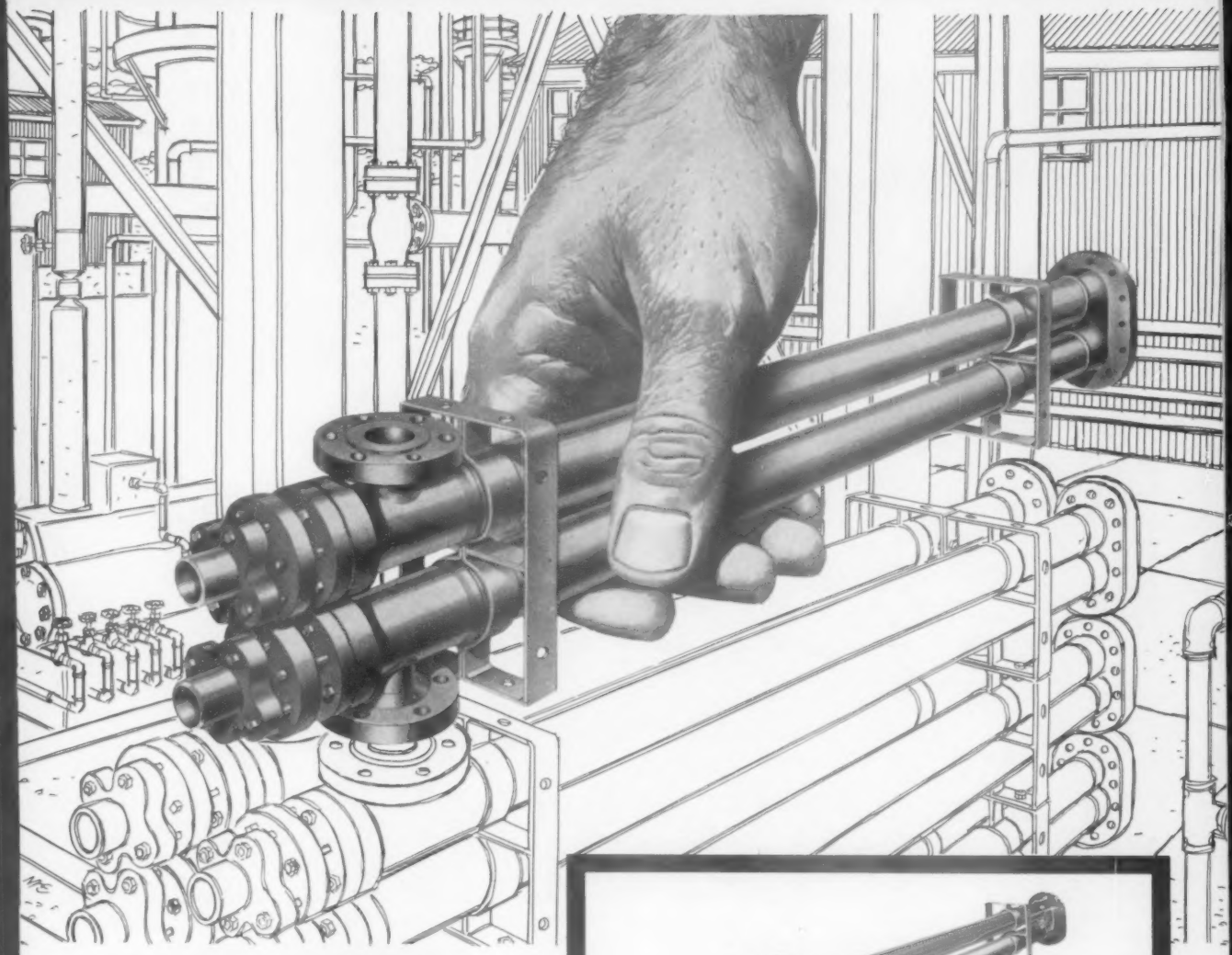
10-12 American Petroleum Institute, Mid-Continent district production division meeting, Mayo Hotel, Tulsa.

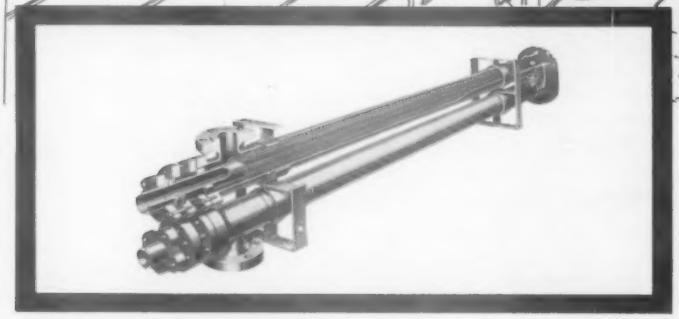
11-13 Institute of Radio Engineers, ninth annual southwestern I.R.E. conference and electronics show, sponsored by Houston section, Shamrock Hilton, Houston.

11-13 Institute of Radio Engineers, second national simulation conference, sponsored by Professional Group on Electronic Computers, Shamrock Hilton Hotel, Houston.

11-13 American Institute of Mining, Metallurgical, and Petroleum Engineers, Pacific Northwest Regional Conference, Portland, Ore.

16-18 Petroleum Industry Electrical Association annual meeting, Shamrock Hilton Hotel, Houston.





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The ALCOTWIN's flexibility means that you can change load or processes within your plant, and still use the same heat-exchange equipment. ALCOTWINS can be easily added for increased load, rearranged for changing processes. They never become obsolete because of their unlimited number of applications. Further, ALCOTWINS are readily available. You can buy them "off the shelf" at ALCO's Beaumont, Texas, plant.

The ALCO gas shielded tungsten arc welding method of fusing the fins to the tube permits the widest possible range of metallurgy. The precise metallurgy needed for optimum results in your application can be selected in an ALCOTWIN. The many combinations of tube and fin materials available mean more efficient performance in high temperature services.

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Complete information is available from any of ALCO's sales offices. For a copy of Bulletin FH-3 write Petroleum Industry Equipment Division, Dept. AW-1, P. O. Box 1065, Schenectady 1, N. Y.

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16-18 Petroleum Electric Suppliers Association, Shamrock Hilton Hotel, Houston.

16-18 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.

16-18 National Petroleum Association, fifty-fourth semiannual meeting, Cleveland.

18-19 Texas Petroleum Research Committee and Permian Basin Section of American Institute of Mining, Metallurgical, and Petroleum Engineers, tenth annual oil-recovery conference, Midland, Tex.

24-26 National Gasoline Association of America, thirty-sixth annual convention, Rice Hotel, Houston.

24-26 American Petroleum Institute, Rocky Mountain district production division meeting, Gladstone, Townsend, and Henning Hotels, Casper, Wyo.

25-27 American Association of Petroleum Landmen, third annual convention, Hilton Hotel, San Antonio, Tex.

28-30 Independent Petroleum Association of America, midyear meeting, Buena Vista Hotel, Biloxi, Miss.

29-30 Automatic Control in the Petroleum and Chemical Industries, conference sponsored by the University of Oklahoma, extension study center, University of Oklahoma, Norman, Okla.

29-May 1 Southern Gas Association, annual convention, New Orleans.

MAY

6-8 American Petroleum Institute, annual pipeline conference, Cleveland Hotel, Cleveland.

6-8 American Geophysical Union, thirty-eighth annual meeting, National Academy of Sciences, Washington, D. C.

7 American Gas Association, committee on underground storage, operating section, Mark Hopkins Hotel, San Francisco.

8-10 American Gas Association, Pacific Coast Gas Association, gas supply, transmission, and storage conference, Mark Hopkins Hotel, San Francisco.

12-15 Liquefied Petroleum Gas Association, annual meeting, Conrad Hilton Hotel, Chicago.

13-15 Industrial Waste Conference, sponsored by Purdue University, Purdue Memorial Union Building, Lafayette, Ind.

13-16 American Petroleum Institute, division of refining, midyear meeting, Sheraton Hotel, Philadelphia.

14-16 Industrial Nuclear Technology Conference, sponsored by Armour Research Foundation of Illinois Institute of Technology and Nucleonics Magazine, Museum of Science and Industry, Chicago.

19-22 Texas Independent Producers and Royalty Owners Association, Galvez and Buccaneer Hotel, Galveston, Tex.

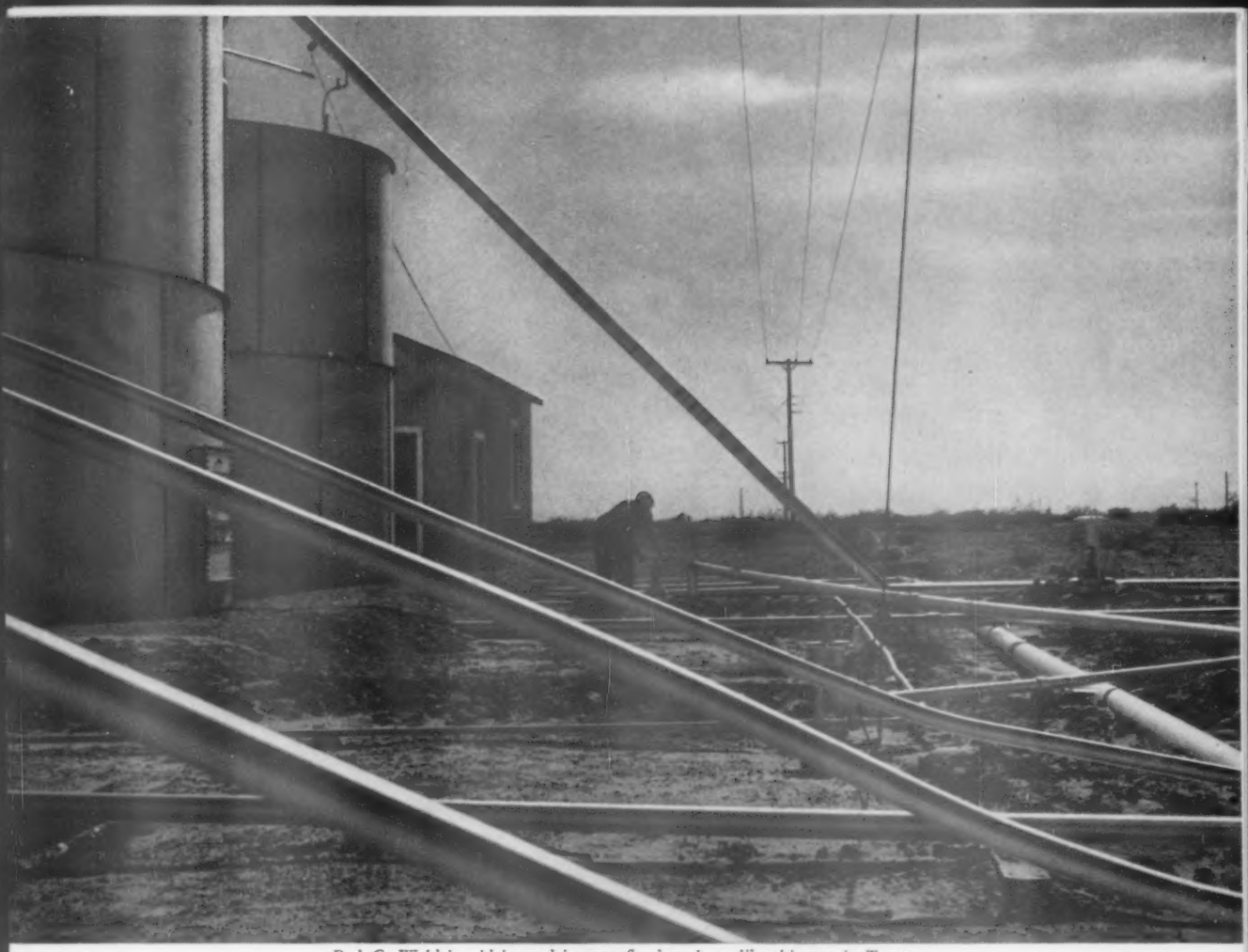
20-22 American Gas Association, chemical, engineering, and manufactured gas production conference, Balmoral Hotel, Bal Harbour, Fla.

20-23 American Society of Mechanical Engineers, twenty-ninth annual conference and exhibit of the oil and gas power division, Kentucky Hotel, Louisville, Ky.

21-23 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

22-24 American Petroleum Institute, division of production, Eastern district meeting, William Penn Hotel, Pittsburgh.

23-24 Kentucky Oil and Gas Association, annual membership meeting, Hotel Phoenix, Lexington, Ky.



Beth-Co-Weld is widely used in waterflood projects, like this one in Texas.

BETH-CO-WELD - *a highly respected pipe for oil-country service*

Beth-Co-Weld line pipe, a product of Bethlehem Steel, is the top choice of many operators for use around the lease or rig. One of the first fully accepted types of continuous-weld pipe, it is known throughout the oil fields for its soundness and uniformity.

Bethlehem Supply stores carry Beth-Co-Weld. When in the market for line pipe, call our nearest store and check the inventory. Chances are, you can get the Beth-Co-Weld you want from stock.

Quick Facts About Beth-Co-Weld

Can be furnished to the requirements of ASTM A-120 and A-53, API 5-L, and other equivalent specifications.

Available coated, or uncoated for field wrapping. Can also be obtained mill-wrapped.

Sizes from ½ in. nominal to 4½ in. OD, black and galvanized, in standard weights; from ½ in. through 3 in. nominal in extra-strong weights.

Sizes 3½ in. OD and 4½ in. OD in some weights lighter than standard.

Furnished in single mill lengths, and in sizes 1½ in. through 4½ in. OD in double mill lengths up to 50 ft.

Types of ends: threaded-and-coupled, plain-end-beveled for welding, or plain-end-square-cut, grooved for ring-joint coupling.

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TULSA, OKLAHOMA

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JOURNALLY SPEAKING . . .

The Great Secret

IF we were a greenhorn in this business we would have got all excited about a letter that came in the other day. It promises to put the entire oil industry completely out of business.

The letter is from a wholesale distributor of automotive supplies in Brooklyn, which, according to its letterhead, handles articles for garages and service stations manufactured by more than a score of leading firms.

"We have recently been appointed exclusive selling agents for a type of 'fuel' do-it-yourself kit," it said. Incidentally, the word "fuel" was used in quotation marks throughout the letter.

"This 'fuel' is made with water plus Chemical X, and is capable of running any size combustible motor. The kit is connected directly to the intake manifold, eliminating the carburetor.

"The 'fuel' can become the future product to be used on all vehicles with very few changes. The motorist will be able to make this 'fuel' automatically as he rides by having an additional supply of Chemical X in his glove compartment.

"A complete demonstration can be given to you by appointment at which time we will make the 'fuel' and run the motor."

But (yawn) we're not going to ask for a demonstration. This is where we came in.

One of the very first assignments we got as a cub reporter was to cover a demonstration of running a motor on water mixed with Chemical X—way back before the depression. The inventor was a country boy from Georgia, and his backers were very mysterious about the whole thing. This was a private press preview, prior to the whispered big announcement that a huge corporation was going to be set up to market this new marvel.

Up in the hotel room the young man took a bottle of red powder into the bathroom, where, he said, he mixed it with about a quart of water. He poured this into a fuel tank of a tiny one-cylinder engine.

Then he spun the flywheel. Nothing happened. He spun it a dozen times more. The engine gave three or four putts, and then died. This continued for half an hour. The engine never did fire more than half a dozen times in succession. The boy got red in the neck, and his backers got fidgety.

"It usually runs fine," they said. "See if the spark plug is clean."

But no manner of adjustment would make that engine perform on the mixture of water and secret chemical. One by one the reporters excused themselves to phone their offices. They never came back. Presently we did the same.

For weeks after that we naively watched the newspapers for the big headlines about this revolutionary new invention that would displace gasoline. They never appeared.

However, we did hear more about this scheme for running automobiles on water with the addition of a pinch of secret chemical. Every 3 or 4 years since then, in fact. It was always in the form of a rumor that "the oil monopoly" had bought up the patent and suppressed it because it worked so well that it threatened the continuation of the oil industry's enormous profits.

We half believed that rumor the first few times we heard it, back in our salad days. Then it began to dawn on us that if this invention was really any good it simply couldn't be suppressed very long in a country like this. If one person can devise a way to run a car on water, so can others. And if one oil company had the secret it would rush to get the jump on its competitors by getting into this new business first.

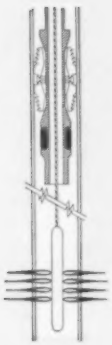
During the war, when patriotic individual inventors and big corporations alike were offering all their knowledge and resources to help the Government lick the oil shortage, nothing whatever was heard of the mysterious chemical that would make engines run on water. We thought the idea was completely dead and buried. Until we got this letter the other day.

So now a Brooklyn auto-supply company has the patent. Very interesting. Wonder how soon gasoline will be obsolete and all oil companies will be out of business.

Well, now that the football bowl games are over, we may soon be hearing about spring-training plans of the major league baseball teams. Ho, hum. Wonder what's on television tonight.

—Henry D. Ralph.

Here's what you can do with the **BAKER FULL-BORE RETRIEVABLE CEMENTER**

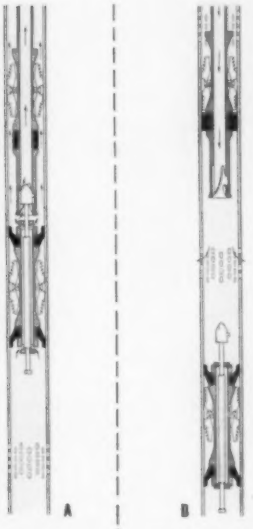


PERFORATE

FRACTURE
ACIDIZE
CEMENT

SWAB
AND
TEST

or use it with a **BAKER RETRIEVABLE BRIDGE PLUG** for as many straddle operations as required... in **ONE ROUND TRIP!**



A — Run tools in together

B — Release Plug, straddle interval, fracture or acidize

Swab and Test

C

Pick up plug, move to next interval

D

here's why it does these jobs better...

HOLDS HIGH PRESSURES FROM ABOVE OR BELOW Contains two sets of opposed "Rocker-Type Slips". Once packing element is packed off, pressure from above or below is automatically transferred through the proper set of slips to the casing.

FULL-BORE (Tubing I.D.) permits passage of instruments, or guns; prevents "screen-out" during fracturing operations.

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Write for Catalog Supplements 319, 322, 323 for complete information on these products and their applications.

How to remove the pipeline bottleneck

THE need for more crude-oil pipeline capacity in the United States should now be quite evident to the general public as well as to officials charged with planning for our national defense.

The difficulty in meeting Europe's emergency needs for oil and supplying our own East Coast refineries cut off from Middle East imports is due only partially to shortage of tankers and not at all to lack of crude-producing capacity in this country. The bottleneck is pipelines from fields to refining and shipping centers.

A government study, recently released, gives official support to what the oil industry knew all along—that crude can be produced far beyond the ability of our transportation system to move it to where it can be used.

THIS EXPLAINS the action of Texas and other states in refusing to sanction wide-open production of their oil fields. To have done so would have piled up wasteful surpluses in areas lacking the pipeline capacity to move all the output.

Exactly how much reserve producing capacity we have is a matter of dispute, but there is no doubt that it is substantially above pipeline capacity. Therefore this unusable producibility is of little value in a national emergency.

How this came about is not much of a mystery. Pipelines will not be built, nor extended to new fields and wells, unless there is reasonable assurance of a market for the crude they could transport. During the past several years there has been more domestic crude available, both in new fields and in those already connected to pipelines, than the market would absorb.

The reason for this, too, is not hard to trace. Imports have been taking an increasing share of the market. Expansion of crude-transportation facilities has been relatively greater in the form of ocean-going tankers than in internal pipelines.

Consumers in eastern states have probably got their gasoline a little cheaper as a result. But this has been at the cost of national defense. Because of the pipeline deficiency, the domestic industry is unable to make use of the crude capacity it has built up at enormous expense.

THE SOLUTION is to put a ceiling on imports to keep them in some reasonable relation to the growth in the United States demand and to effective domestic capacity.

Excess producing capacity is essential to national defense. But it is of little use by itself. The way to get the equally essential transportation capacity is to give the industry the economic incentives to expand pipelines in pace with the growth of production.

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And, of course, the core of Anchor's success is the experienced group of men who wear Anchor's two "hats". Call them in on your problems of selling or buying petroleum products. Phone Anchor in Tulsa, CHerry 2-7261.

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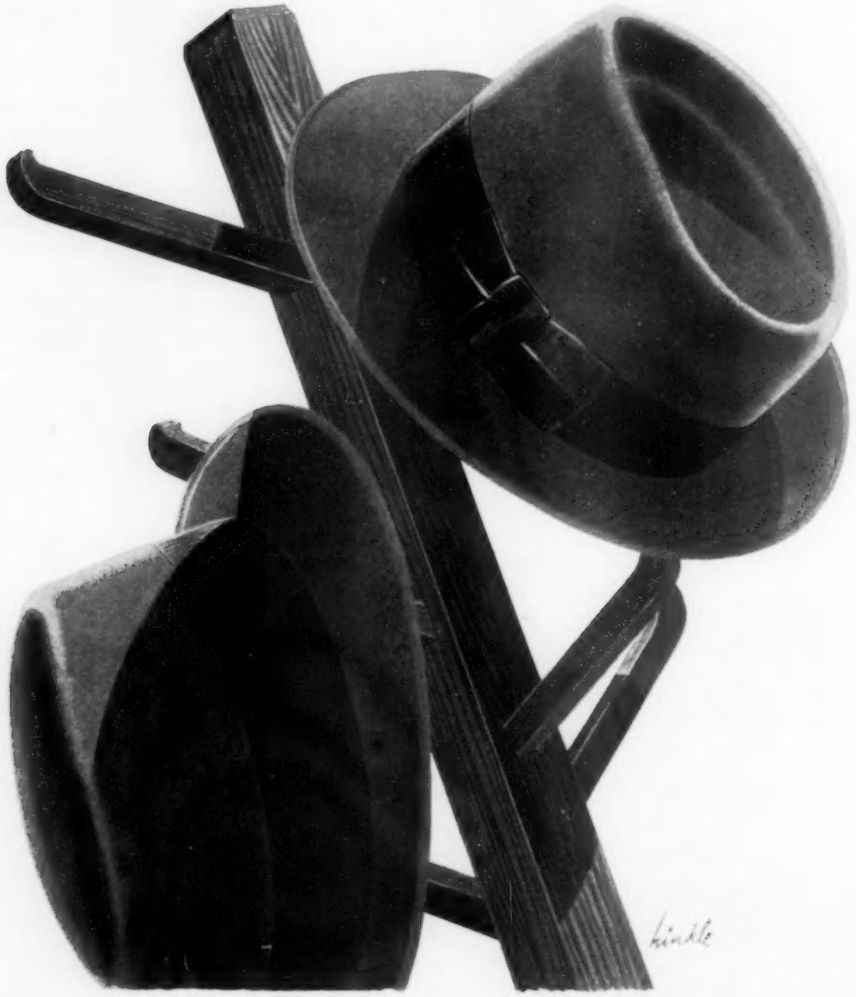


The Industry This Week

• **PIPELINING:** One of the biggest deals in pipeline history is developing. El Paso Natural Gas is acquiring Pacific Northwest's vast system in a stock exchange deal. The result will be the world's biggest pipeline system, running all the way from the Mexican border to the Canadian border and funneling a huge supply of gas into California and the Pacific Northwest. The acquisition will give El Paso Natural badly-needed reserves and plenty of room to expand its operations. P. 58.

Members of the Pipe Line Contractors Association got an idea of what may be current thinking in Washington—and it wasn't good. A member of the FPC outlined a proposal whereby products and crude lines would fall under stricter government regulation. P. 64.

• **INDUSTRY:** Higher oil prices now have a better chance of sticking after these developments: California and Penn-grade crudes went up to make the increase nationwide. Canadian and Venezuelan oil joined the upward movement. P. 62.

Natural-gas producers have the full support of President Eisenhower for a bill freeing them from federal regulation. It came in his annual budget message to Congress. P. 61.

Eisenhower's budget includes 9½ per cent more spending next fiscal year for oil and gas purchase and administration. P. 68.

What'll happen after the Middle East crisis gets different answers in the industry. Texaco's A. N. Lilley says an important new era of development will follow. P. 76. Creole's H. W. Haight warns Venezuela to expect restricted markets. P. 77.

• **PRODUCTION:** Flexibility in a water-flood project has been achieved by Shell engineers. They mounted a 5,000-bbl. water-treating plant on skids for easy moving in California. P. 72.

Yugoslavia will get technical help on its oil-production problems from two Texas consultants. The contract has approval of U. S. State Department. P. 75.

• **EXPLORATION:** First commercial oil production from southeastern Colorado's Las Animas arch has been found by Conoco at the 1 Lynn in Kiowa County. P. 69.

New discovery in Sicily by Italian government company may be used as wedge for government monopoly in the island's oil industry. P. 96.

Another drilling rig is being assembled at Houston for use in Dhofar, where Cities Service and Richfield have 32,000-sq. mile concession. P. 75.

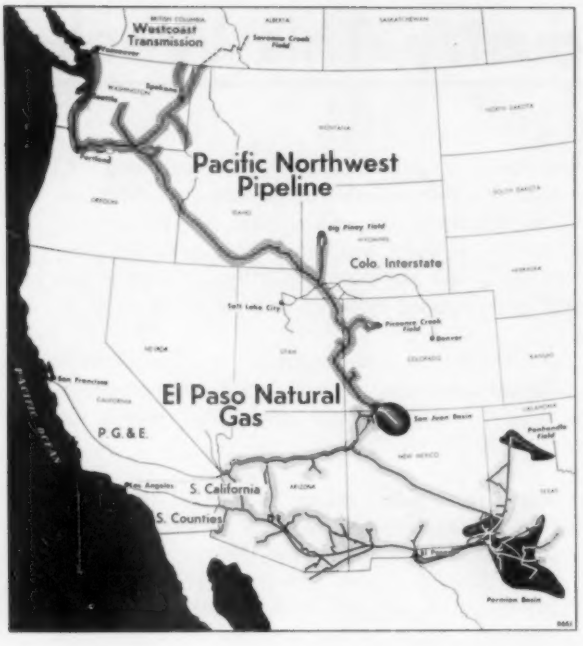
• **REFINING:** Processing Canada's Athabasca tar sands on a large scale soon may be a reality. Royalite will start a plant this spring as part of a $50 million development program. The action climaxes 2 years of research. P. 66.

These trends in new-motor development were reported to S.A.E. convention in Detroit: Gas turbines for autos still are far off. Fuel injection is more promising but faces problems. Atomic power plants for cars are out of the question. P. 70.

First Ultraformer in Kansas has been installed by Derby Refining at Wichita in $1¼-million expansion. P. 60.

Note to refiners plagued by rising property taxes: Esso prevented a hike at Bayonne by threatening to pull out. P. 60.

Another chemical firm has bought into oil. Hydrocarbon Chemical purchased Coffield & Guthrie, Inc. of Texas. P. 71.



What El Paso Gets . . .

- RESERVES: 11 trillion cu. ft.
- LINES Over 2,300 miles with 339,000 M.c.f. daily capacity.
- LEASES: Over 304,000 acres and 246 producing gas wells.
- PLUS: Green light to expand.

Deal with Pacific Northwest adds up to . . .

. . . World's Largest Pipeline In Making

UNTIL last week, California had a shaky natural-gas supply.

The picture looked like this: A growing population long ago had outstripped the state's own production capacity. Demand constantly was threatening to overtake reserves committed beyond its borders.

Thus dependent entirely on out-of-state gas, Californians could look down the road 15 years and envision a possible shortage.

This gloomy picture changed suddenly last week when stockholders of Pacific Northwest Pipeline Corp. started exchanging their stock for that of El Paso Natural Gas Co.

Acquisition of Pacific Northwest would give El Paso Natural—and its customers in California—one of the firmest long-range supplies ever enjoyed by any company or any group of consumers.

What it means . . . The deal means California can count on two new reserves from which to draw future gas requirements. These include:

. . . Vast supplies in the rapidly developing San Juan basin of Colorado and New Mexico plus others in the upper Rockies.

. . . Potentially greater supplies still awaiting a market in Canada.

Besides enhancing El Paso Natural's long-range supply situation, control of Pacific Northwest would give it:

. . . A promising marketing area where natural gas still is a novelty.

. . . Pipeline facilities totaling more than 2,300 miles.

. . . Oil and gas leases covering more than 300,000 acres.

. . . About 25 per cent interest in Westcoast Transmission Co., Ltd. This is a Canadian firm now building a line to tie in Alberta and British Columbia gas reserves with those of Pacific Northwest.

. . . Chance to expand its operations, through Pacific Northwest subsidiaries, in oil and gas production, manufacture of chemicals, refining, and marketing of petroleum products.

If the Pacific Northwest deal goes through as expected, it will give El Paso both reserves and potential markets for future expansion. As a result, El Paso could become the world's largest pipeline company.

The agreement . . . El Paso's offer to Pacific Northwest came as no great surprise to the industry.

Rumors of negotiations between the two companies had been whispered off and on ever since Pacific Northwest was founded.

Before the merger offer was announced last November, relations between the companies had ranged from outright hostility to professional coolness, then to mutual cooperation.

In a recent spirit of friendliness Pacific Northwest had agreed, in effect, to trade El Paso Natural 50,000,000 cu. ft. of gas per day at the San Juan basin for an equal amount of gas at the Canadian border. On the basis of this agreement, starting next January, officials of both companies had spoken freely of the possibility of reversing the flow of Pacific Northwest's line to help supply California with Canadian gas in the future.

Officials of both companies were confident last week that Pacific Northwest stockholders would approve El Paso's acquisition plan. El Paso is seeking a minimum of 2,435,000 shares of Pacific Northwest's outstanding stock. This would represent about 81.4 per cent ownership.

Directors of Pacific Northwest, who hold about 12 per cent of the stock outstanding, have contracted to transfer their stock to El Paso.

El Paso's original offer called for issuing seven shares of common in exchange for eight shares of Pacific Northwest. The exchange rate was altered to 14 for 8 or 1¾ to 1, follow-

PAUL KAYSER
. . . Head of a growing giant.

ing a recent two-for-one split in El Paso stock.

At the current price of about $30 a share for El Paso stock, the company would be giving about $50 per share for Pacific Northwest stock. Its recent price has ranged from about $47 to $50.

At last week's quotations El Paso would be paying nearly $150,000,000 for full ownership of Pacific Northwest.

The transaction would become effective as soon as El Paso acquired the minimum of about 81.4 per cent of Pacific Northwest's stock. Officials expected the goal to be reached within a few days. El Paso was given the option of keeping its offer open until next May 1, however, to increase its holdings beyond 81.4 per cent.

Property involved . . . Principal physical assets of Pacific Northwest are its 1,482 miles of big-inch transmission lines extending from the San Juan basin straddling the Colorado-New Mexico border to the Canadian boundary near Sumas, Wash. The main line includes 671 miles of 22-in. pipe and 811 miles of 26-in. pipe.

In addition, Pacific Northwest's system includes 891 miles of sales and supply laterals and field gathering lines.

The system went into operation late last summer. It has a capacity at present of about 339,000,000 cu. ft. per day.

The Federal Power Commission has approved plans for expanding the capacity to about 639,000,000 cu. ft. daily, and Pacific Northwest has announced plans to complete this project during 1957. Cost of the initial expansion is estimated at about $30,000,000. The increased capacity will enable Pacific Northwest to import up to 300,000,000 cu. ft. of gas per day from Canada. The import plan, also approved by the FPC, is scheduled to start next fall. Initial deliveries will be at the rate of 200,000,000 cu. ft. per day.

Pacific Northwest, which purchased large volumes of San Juan basin gas "in place" and plans to produce a large per cent of its pipeline requirements, owned 246.2 net producing gas wells as of last November 1. From then until January 1, it completed or was drilling about 14.5 net wells.

Under the company's unusual supply arrangements it had planned to drill about 239 wells for itself during 1957 and 1958. Additional wells are planned from time to time thereafter as necessary to meet market demands or fulfill lease agreements.

Reserves . . . The company owns oil and gas leases covering about 304,000 acres in the San Juan basin.

Besides its own production, the company has reserves contracted from other producers in San Juan basin and in Piceance Creek, Bar-X, Rangely, Big Piney, Tip Top, and Hogsback fields.

Brokaw, Dixon & McKee, independent petroleum engineers, have estimated Pacific Northwest's domestic reserves of natural gas at 4,896 billion cubic feet. This sum includes the company's own production potential and reserves under contract. Of the domestic total, it is esitmated that 1,037 billion cubic feet is in the developed portion of San Juan basin and 2,812 billion cubic feet is under undeveloped acreage in the same area.

Some geologists have estimated Pacific Northwest's reserves in the San Juan basin at about double the volume mentioned by Brokaw, Dixon & McKee. The higher estimates are based in part on the assumption that improved fracturing methods will greatly increase the output of tight gas formations.

Farther north, especially in Wyoming, Pacific Northwest has contracted for gas in several fields whose potential has not been determined. These fields, together with increased reserves in San Juan, may boost Pacific's domestic supply to nearly 9,000 billion cubic feet.

The Canadian reserves under contract to Pacific Northwest have been estimated at 2,200 billion cubic feet or more.

Subsidiaries . . . In conjunction with its pipeline system Pacific Northwest operates a gasoline plant near Ignacio, Colo.

Having a capacity of about 284,000,000 cu. ft. of gas per day, the plant extracts propane, butane, and natural gasoline from San Juan basin production. El Paso has agreed temporarily to transport up to 2,000 bbl. per day of products from this plant through its line between Blanco and Wingate, N. M.

RAY C. FISH
. . . One of its biggest stockholders

Pacific Northwest also has part or full interest in four subsidiaries:

. . . Northwest Production Corp., in which Pacific Northwest has about 67 per cent interest, has leases and options on approximately 118,000 acres in San Juan basin. As of last November 1 the subsidiary had 18.75 net commercial producers. It has a wholly owned subsidiary, Northwest Pipeline Corp., which was formed last summer to build and operate a 500-mile crude and products pipeline from Ignacio, Colo., to Salt Lake City.

Northwest Production also has entered a conditional agreement to merge with Western States Refining Co., Salt Lake refining and marketing firm. In a more recent deal it acquired the assets of Barnhart Hydrocarbon Corp., which operates a large gasoline plant in the Permian basin.

. . . Phillips Pacific Chemical Co., in which Pacific Northwest owns 49 per cent interest, is building an ammonia plant near Kennewick, Wash. Natural gas from the Pacific Northwest line will be used as raw material.

. . . Westcoast Investment Corp., wholly owned subsidiary of Pacific Northwest, owns 25 per cent of the outstanding shares of Westcoast Transmission Co., Ltd.

. . . Pacific Northwest Realty Corp., another wholly owned subsidiary, has purchased a piece of property in Salt Lake City for $434,000. Plans call for construction of Pacific Northwest's operating headquarters there.

Pacific Northwest's future . . . El Paso

officials have announced plans to operate Pacific Northwest as a subsidiary.

A favorable tax ruling received from the Internal Revenue Service is based on El Paso's representation that it has no present intent to merge Pacific Northwest into El Paso.

Paul Kayser, president of El Paso, and Howard Boyd, a vice president, are expected to be named directors of Pacific Northwest.

Under the exchange offer, Ray C. Fish, chairman of the board of Pacific Northwest, will become one of the largest individual stockholders in El Paso Natural. Last December 1 Fish had 118,892 shares of Pacific Northwest stock. This would translate into about 208,000 shares of El Paso's new Class B common.

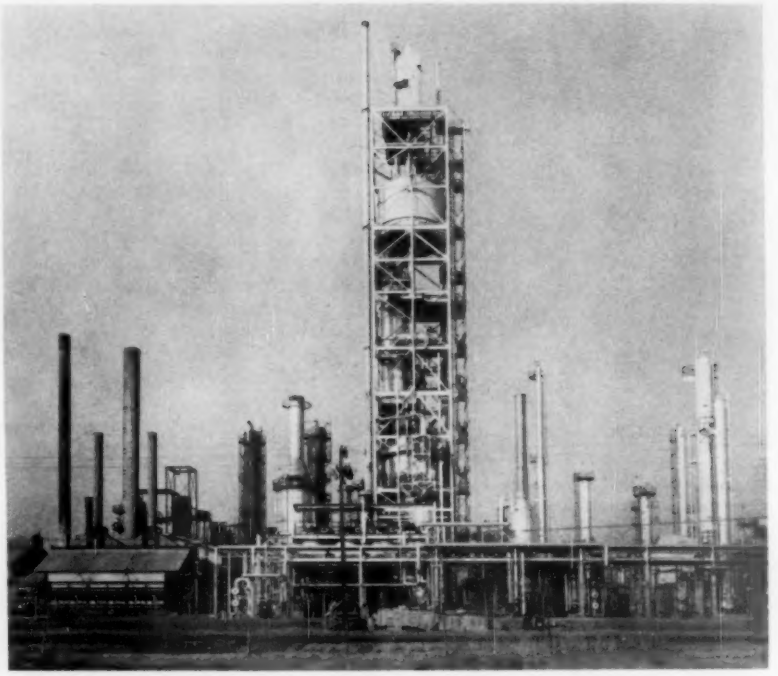
El Paso has pointed out that the two pipeline systems "do not duplicate but rather complement each other" and that plans call for coordinatinon of their combined reserves in Canada and in the San Juan basin. As a result of the stock exchange, El Paso is expected to rely heavily on Alberta and British Columbia gas reserves for future market expansion.

Need for additional reserves was emphasized recently by the FPC. In approving El Paso's current $84,658,000 expansion program, the FPC cautioned that the company's demand threatens to overburden its supplies within a few years *(The Oil and Gas Journal, December 31, 1956, page 97)*. El Paso gets most of its gas from Permian basin, San Juan basin, and Texas Panhandle.

In addition to its own mushrooming service area in California and southwestern states, the stock exchange would give El Paso a ready market in more than 100 communities from New Mexico northwest to Washington and Idaho. Most of this vast area was without natural gas until completion of the Pacific Northwest line late last year.

Combined assets of El Paso Natural and Pacific Northwest total about $984,257,000. The combined pipeline system, rivaling Tennessee Gas Transmission Co.'s system as the world's largest, includes 7,901 miles of main transmission lines and about 4,360 miles of sales and supply laterals.

Authorized expansion programs of El Paso and Pacific Northwest would boost their total pipeline mileage to about 12,692 miles. Combined pipeline capacity, now totaling 2,277,000 M.c.f. per day, would be increased to about 3,177,000 M.c.f. per day under presently authorized expansion programs. This is far greater than the capacity of any other gas line at present.



Ultraforming Comes to Kansas

WICHITA.—Derby Refining Co. has just wound up its second major expansion in the past 6 years and is eyeing the field of petrochemicals.

In a $1¼-million program, the company installed the first Ultraformer in Kansas. Officials said they are studying the possibility of producing synthetic chemicals with the unit.

Derby, which has its own service-station outlets, will apparently produce gasolines in the 100-octane range. The company described the Ultraformer as making it possible for the plant to meet "the highest requirements of 1957 and foreseeable future automobile designs."

The expansion program also boosted crude capacity by 25 per cent, from 16,000 bbl. to 20,000 bbl. daily, and added to the plant's asphalt capacity.

Esso's Threat Averts Tax Hike

BAYONNE.—This New Jersey city of 80,000 and site of an Esso Standard Oil Co. lube and asphalt plant has slashed its 1957 municipal budget to 90 per cent of 1956 spending.

The economy drive came after Esso threatened to close its Bayonne plant if taxes did not come down.

Bayonne long has been known as one of the country's highest tax municipalities. It had boosted Esso's tax to $2,786,000 in 1956, an increase of $1,000,000 since 1947. The prospect of another increase in 1957 caused Dr. David Edwards, manager of the refinery, to issue a warning. He told the city commission that higher taxes would mean one of two things: Curtailment of operations by Esso or closing the plant.

Proposed budget of Bayonne's city commission was about $8,000,000 per year. Its public safety director found that he could cut $263,000 from his request for $2,740,000. The superintendent of schools proposed to cut the school budget $617,000 from $3,549,382. At a meeting last Monday, city commission and school-board officials agreed to meet Dr. Edwards' proposal.

Next year's tax increase was held justified by the loss of some $10,000,000 ratables, primarily resulting from the closing of the Tidewater refinery in 1955. Shutdown of the Esso plant would have aggravated the situation.

Esso is a member and one of the founders of Bayonne's Economic Research Council formed several years ago to bring about more economic government.

Esso's share of the proposed increase would have been $250,000-$300,000, making its total tax bill some $3,000,000 per year, almost twice what it was 10 years before.

Ike Revives Gas Bill

President asks Congress to free independent producers; wants consumer protection by pipeline cost-item control

WASHINGTON. — The full support of the administration was thrown behind repeal of federal regulation of independent gas producers last week.

Producers must be freed from federal control if the nation is to have an adequate gas supply, President Eisenhower told Congress in his annual budget message. He indicated that the Government's only concern should be that of protecting the consumer against unfair prices.

Eisenhower's quick action to get the repeal ball rolling came as a welcome surprise to the industry and its supporters in Congress. It had been expected generally that if the President came out for the bill it would be in one of his messages later in the session.

The unqualified support given by the White House will insure that a repeal bill will come up this session. Democratic leaders who supported the bill in the last Congress were unwilling to head the fight again in the light of the Case "incident" and subsequent veto of the measure last year.

Both Senate Majority Leader Johnson and House Speaker Rayburn indicated before the session that a bill would be brought up only if the President asked for it. If House and Senate commerce committees didn't take the matter up early in the session it would die, it was said.

Bills carrying out the President's recommendation are ready for committee study. Up to the time that Eisenhower sent his budget to Congress, only one such measure had been introduced. It was not sponsored by the industry. Eisenhower's statement, however, gave the opportunity for action which was quickly seized.

What Ike said . . . "In returning the Harris-Fulbright natural gas bill to the 84th Congress without my approval, I stated that legislation conforming to the basic objectives of that bill was needed," Eisenhower said. "I am still of that opinion.

"It is essential that consumers of natural gas be protected. We must endeavor to make sure that there will be continued exploration and development of adequate field supplies of gas, and that producers' sales prices are arrived at fairly and competitively.

"In this way, and with authority vested in the Federal Power Commission to regulate interstate pipelines as to the prices at which gas may be charged as an item of cost in fixing rates, the price to the public will be fair.

"Legislation freeing gas producers from public utility-type regulation is essential if the incentives to find and develop new supplies of gas are to be preserved and sales of gas to interstate markets are not to be discouraged to the detriment of both consumers and producers, as well as the national interest."

Opposing forces . . . Opposition to the legislation has already come from Republican Senator Wiley and Democrat Representative Reuss, both of Wisconsin.

They went on record as supporting, instead, a resolution adopted by the Milwaukee City Council to fight any new gas bill which would free producers from federal control.

"I feel," Wiley said, "that if we are to control effectively the inflationary forces in our country, we dare not deny to the Federal Power Commission . . . authority to protect consumers . . ."

Democratic leaders were critical of what they termed the weakness of the President's statement, declaring that he would have to come out more strongly if they are to work for the bill.

But this doesn't amount to opposition. And observers said President Eisenhower's support insures a gas bill at this session. They predict that slight differences of opinion will fade before demands from producing states for action.

Oklahoma allowables blamed as . . .

. . . Two Firms Moving To Texas

TULSA. — Two Oklahoma-based oil companies are striking out for happier oil-hunting grounds in Texas.

Frankfort Oil Co. of Bartlesville will move its headquarters to Dallas February 14.

Toklan Oil Corp. of Tulsa plans a similar move to Houston for February 1.

Both firms announced the same reasons for moving. Frankfort said one of its reasons was "inequitable allowables in Oklahoma." Toklan blamed "stringent allowables in Oklahoma."

Oklahoma's system of setting production allowables has long been under fire and currently is one of the industry's major problems *(The Oil and Gas Journal, December 31, 1956, page 86; January 7, page 72; and January 14, page 68).*

Frankfort plans . . . The Frankfort company is owned by Distillers Corp.-Seagrams, Ltd., through its subsidiary, Calvert Distilling Co. It has more than 2,000 bbl. daily oil production in southern Oklahoma and Louisiana.

Carroll M. Bennett, director of oil operations for Distillers Corp.-Seagrams, said in Dallas last week that Frankfort plans to expand greatly its exploration program in Texas and Louisiana.

The company currently is drilling three wildcats in Oklahoma and two in Louisiana. It will soon spud in another in Texas' Palo Duro basin in a joint drilling deal with Burdell Oil Co. Frankfort also jointly holds 1,100,000 acres in the Yakutat Bay area of Alaska with Colorado Oil & Gas Corp.

Harry H. Mack, formerly production vice president for the old Sunray Oil Corp., Tulsa, is general manager of Frankfort. Don Simic, former exploration manager of Bay Petroleum Co., is manager of exploration. Tom P. Brooks, formerly with Southern Production Co., is production manager.

Frankfort will occupy four floors in the Davis Building in Dallas. About 25 geological and engineering personnel will make the move from Bartlesville. Branch offices will be retained in Ardmore and Oklahoma City, New Orleans, and Opelousas, La.

Toklan plans . . . The Toklan move will involve top management and the accounting and lease records divisions. Production and Mid-Continent geological personnel will remain in Tulsa.

A. F. Childers, Jr., Toklan president, said: "Stringent allowables in Oklahoma, where most of our recent drilling has been done, drastically curtail income. It is felt that new and larger reserves can be more quickly built up in the Gulf Coast area of Texas and Louisiana."

He explained that the Mid-Continent area program will continue. But Toklan will expand its activities to include lease and production acquisitions as well as exploratory drilling in the Gulf Coast of Texas and Louisiana.

Toklan will retain its district offices in Pawhuska, Okla., McPherson, Kans., and Fairfield, Ill.

With Canada, Venezuela prices moving up . . .

Western Hemisphere Hikes May Stick

CRUDE-PRICE increases which started in the U. S. Gulf Coast and Mid-Continent areas nearly ran full circle in the Western Hemisphere last week.

These were the developments:

. . . **Canadian prices** went up as much as 18 cents per barrel.

. . . **Venezuela** got hikes ranging from 5 to 35 cents.

. . . **Penn-grade crude** rose 20 cents.

. . . **California prices** moved up late in the week, averaging 25 cents more for medium grades, 12 cents for heavier crude and 16 cents for the lighter oils.

Earlier, crude prices in the U. S. had risen by as much as 25 cents per barrel in the Illinois Basin, Rockies, Mid-Continent, North and West Texas to 40 cents on the Gulf Coast.

The pattern became definite last week when Continental Oil Co., the first major purchaser to spread the higher prices outside of Texas, readjusted its postings. Conoco cut its increase by 10 cents a barrel in Texas, Oklahoma, Kansas and the Rockies and by 5 cents in New Mexico.

Other purchasers had adjusted to smaller increases previously in these regions.

The increased crude prices and an accompanying increase in the prices on products brought demands for investigations in Washington. The inquiries were threatened from several sources.

Vital moves . . . American oil producers were relieved when price increases were announced in Canada and Venezuela.

They think now that Western Hemisphere price hikes have a good chance of sticking when Middle East oil fields return to normal production.

Economists who hold this line of reasoning said that if Canadian and Venezuelan crude prices had remained low it would have been difficult to maintain a higher price structure in the U. S. after the Middle East crisis. The various Western Hemisphere oils are competitive, they contend. If one holds a price advantage others have to meet it.

Imperial Oil, Ltd., touched off the Canadian price increases. The company, an affiliate of Standard Oil Co. (N. J.), is Canada's largest crude buyer. Other companies are certain to follow.

Imperial announced it would pay 18 cents per barrel more in areas where it buys with two exceptions. Turner Valley crude, a light grade, was not increased at all; and Pembina oil got only a 13-cent increase.

Canadian crude prices are geared to prevailing prices in the Illinois basin. This U. S. area got a 25-cent increase the week before. So Imperial's 18-cent increase is about the equivalent of this when currency exchange differences are considered.

Venezuelan action . . . The price parade in Venezuela was led by Creole Petroleum Corp. (Jersey Standard) and Mene Grande Oil Co. (Gulf).

The top increase was made by Creole, which boosted four of the 19 grades it offers purchasers by 35 cents. Mene Grande increased four grades by 30 cents, but did not increase four of its heavy crudes.

Creole officials said the new prices reflect increases in United States crudes. This is particularly true of the Venezuelan crudes that are similar to U. S. production. The company pointed out that increases in heavier crudes were only 5 cents to 8 cents a barrel since these crudes were increased a month ago. The further boost, Creole said, is necessary because of continuing increases in heavy-fuel oil prices.

Creole went right down the line of all the crudes it offers increasing them from 5 to 35 cents. Mene Grande put four grades up 30 cents, posted increases ranging from 5 to 27 cents on three grades, left four grades unchanged, and discontinued posting a price on Merey crude.

Socony Mobil Oil Co. of Venezuela quickly followed by posting increases for two grades. It boosted San Joaquin crude by 35 cents and Oficina 23 cents.

Penn-Grade reacts . . . The Joseph Seep Purchasing Agency of South Penn Oil Co. posted the 20-cent increases for producers of Pennsylvania Grade crude.

The new postings sent Bradford district oil to $4.88 a barrel; Middle District in National Transit Co., $4.70; Pennsylvania Grade National Transit Co., $4.41; and Pennsylvania Grade in Eureka Pipe Line Co., $4.23.

This marks the sixth time within a year that Pennsylvania-grade oil prices have risen. Other increases were posted on February 6, March 16, May 16, July 16, and August 16. In that time price for Bradford district oil rose from $3.85 to $4.88, a jump of $1.03. However, highest postwar pricing of Bradford district oil was $5 a barrel which prevailed during most of 1948.

The Seep announcement said the new prices reflect improved realizations due to increases in gasoline and certain distillate fuels. Pennsylvania lubricating oils have not moved upward and normally do not rise at this season.

The West Coast . . . Standard Oil Co. of California started the price ball rolling on the West Coast.

Standard's new postings for Signal Hill gave a 25-cent hike to the 26° and 27°-gravity crude, with the increase getting smaller in both directions. Oil of 14°-gravity got a 10-cent raise and 20°-gravity took a 19-cent boost. On the other end of the scale 37°-gravity was given a 14-cent increase.

Socal at the same time increased the refinery price of heavy fuel oil by 15 cents a barrel and gasoline and lighter fuels by one-half cent a gallon.

California producers received an increase for their heavier crudes last November. The increases ranged from 40 cents a barrel for 14°-gravity crude to 1 cent a barrel for 35°-gravity oil.

Why 18c In Canada?

THE strange quirk of how an 18-cent crude-price hike in Canada is nearly equivalent to a 25-cent increase in Illinois basin oil is explained by the "Sarnia equation."

This is the equation used by oil purchasers in the two countries to stay competitive in laying down crude to the Sarnia refining area. It considers factors of pipeline tariffs and currency exchange. Here is the equation for Illinois crude and Redwater crude:

	Previous	After hike
Illinois Crude:		
Field price	$2.90	$3.15
Gathering	.10	.10
Pipeline charges	.2911	.2911
Cost at Sarnia (U. S. funds)	$3.2911	$3.5411
Redwater Crude:		
Field price	$2.49	$2.67
Gathering	.0525	.05335
Pipeline charges	.6957	.6831
Cost at Sarnia (Can. funds)	$3.2382	$3.40645
Discount on U. S. funds*	.0529	.136
Total	$3.2911	$3.54245
*Rate of discount, per cent	1.6074	4

Investigations talked . . . The higher crude prices and subsequent rise in product prices aroused a flurry of demands in Congress for investigations of the oil industry.

The Justice Department and Federal Trade Commission disclosed at the same time that they are studying the matter. But spokesmen for both agencies quickly explained their inquiries so far are "routine." Action will be taken only if violations of the antitrust laws are uncovered, they said.

The Justice Department study is aimed at finding if any conspiracy exists among major oil companies to increase prices on an industry-wide basis. Asst. Atty. Gen. Victor R. Hansen, head of the antitrust division, said if such a conspiracy exists, it violates the antitrust laws. Such collusion would constitute illegal price fixing. Hansen stressed the Government has no jurisdiction over the price increases as such.

The FTC inquiry is concerned with how each company applied the increases to its customers. If the raise was not the same to all customers, the action would violate the price-discrimination law.

Congress stirs . . . Meanwhile a welter of demands for probes by congressional committees arose.

Sen. Hubert Humphrey of Minnesota asked for a Justice Department inquiry and requested the Senate small business committee to look into the crude-price hikes.

Staff aides of Senate antitrust subcommittee reportedly had begun preliminary investigation of the price increase. They anticipated hearings which Senator O'Mahoney said he would ask. O'Mahoney also suggested that the Senate interior committee join with the antitrust subcommittee in an investigation.

In the House, at least two committees have shown interest in price hikes. They are the House small business and judiciary committees.

Congressmen report they are receiving many complaints from consumers and small businessmen. They feel that a hearing where company officials could explain facts behind the recent increases might be healthy all around.

The American Automobile Association took up the banner for motorists. In telegrams to the presidents of 16 major companies operating east of the Rocky Mountains, the A.A.A. questioned the "justification" for higher product prices.

On the basis of increases in gasoline stocks, the A.A.A. said, a decrease rather than an increase of gasoline prices is indicated "if the law of supply and demand were applied."

watching WASHINGTON

. . . with Bertram F. Linz

States urge highway caution . . .

STATE highway officials are warning Congress to go slow in expanding the $33-billion road-building program started last year. The motorist's pocketbook won't stand much more of a drain, and that is where a good part of the states' share of the cost will have to come from.

The fear that the whole program might bog down under the burden of financing was raised by the disclosure that a number of states have asked for more mileage than now allotted them. All told, these bids would add several thousand miles to the 41,000 now planned.

There is already talk in some states of higher gasoline taxes. The heavy demands of other expensive projects, schools in particular, appear to rule out the possibility of raising much additional road money from other sources.

There is also some doubt, even in government circles, that the system now planned can be built at the estimated cost. Steel prices have increased and are likely to increase further. Labor costs are going up. And barring a recession, there is little chance that either will go down.

Fast tax writeoffs forever? . . .

THE administration's denial of tax relief for new plants to make steel plate and tubular goods has sparked a drive to make accelerated amortization a permanent part of the tax laws, available to all industry.

The steel industry is pressing the plan. But the oil industry and others will get behind it if Congress appears receptive to the idea.

Close to $40 billion has been put into new plant and facilities since late 1950 under the tax amortization program. Well over $3 billion of this was invested by the oil industry.

The program now is practically closed out. And companies wanting to build new plants are up against three big barriers. Construction costs are higher than ever. Depreciation reserves based on the lower costs of years ago are far from adequate under today's conditions. And money is tight.

Quick tax write-off makes it easier to raise investment funds, Congress is told. The alternative is higher prices to consumers. This was deplored by President Eisenhower in his annual message, and it is a much slower method. The country needs new plants quickly.

Shale oil to arrive soon . . . IF

GIVEN a 27½ per cent depletion allowance on shale, gasoline from shale could be made available in quantity at West Coast service stations in 3 or 4 years, it is now claimed.

Congress will shortly be asked to increase the present 15 per cent allowance to the higher figure. That is all that is necessary, it is asserted, to get a shale-oil industry started in earnest.

Union Oil Co. is scheduled to produce oil from shale next month at its 300-ton pilot retort plant near Grand Valley, Colo. The company has invested $5 million in the experimental station.

Oil interests are ready to put as much as $300,000,000 into plant and pipeline, congressmen have been told. The technological problems are well in hand. The increased depletion allowance would bridge the economic gap and make oil from shale an attractive proposition.

Development of the shale reserves would be a big thing for Rocky Mountain states, and congressmen from that area are expected to get behind the idea unanimously. It would further reduce the West Coast's dependence on imported oil. And it probably would stop any effort to get the Government back into shale research.

The Navy now holds the research plant formerly run by Interior at Rifle, Colo. It hopes to carry on new research there. It has made it known that if any bill for shale research comes up in Congress, the department will support it.

Wider Controls Hinted

● FPC member advocates integrated energy movement plan that would place all pipelines, including crude oil and products lines, under one government agency

BOCA RATON, Fla.—Application of the "public convenience and necessity" yardstick to petroleum as well as natural-gas pipelines was suggested last week by a member of the Federal Power Commission.

In a speech before the Pipe Line Contractors Association, Commissioner William R. Connole also raised the possibility of:

... Overhauling the entire regulatory system to place all pipelines under a single agency.

... Changing the basis for regulating "common-carrier" petroleum lines.

Connole also pointed out that the FPC may soon be empowered by law to prescribe safety standards for building and operating high-pressure gas lines as well as to pass on their feasibility.

WILLIAM R. CONNOLE
. . . suggests one agency for all pipelines.

Regulation "defects" . . . Under a regulatory scheme envisioned by Connole, a new crude or products line would have to be justified before a government agency before it could be built.

Present regulation is confined to rates, accounting rules and standards, and setting minimum tenders of petroleum shipments.

As one of the two defects in regulation today, the commissioner cited the fact that "the petroleum pipeline is the only means of public transportation worth mentioning which does not require a finding by an impartial expert body that the public convenience and necessity requires it."

Yet, he added, an oil line is allowed a fair return "as is any other utility which has been required to prove its need in the public interest."

The other defect listed by Connole is the regulation of oil lines as common carriers "even though they might not be in fact carriers at all."

He went on to cite "a more useful standard" adopted for regulating gas lines. This standard applied the provisions of the Natural Gas Act to the transportation of natural gas in interstate commerce. The FPC has jurisdiction over sales in interstate commerce for resale for ultimate public consumption.

A more direct attack on industry problems was called for.

"I suggest this could well be done as part of a background of the entire energy-distribution function of the country rather than in conjunction with the transportation structure only," he said.

Unified control . . . The present regulation of pipelines was described as a patchwork which vests control in such diverse agencies as the FPC, ICC, Department of Interior, and others.

"Perhaps one agency should be given jurisdiction over all pipelines whether they be petroleum, natural gas, water, bulk commodities, or carriers of other products to the end that unnecessary duplication of regulation" can be avoided, Connole said.

The result, he concluded, would be encouragement rather than hampering of business. This also would lead to an integrated scheme of energy distribution, and uniform treatment of different types of carriers and energy and of the owners of different carriers.

Texans Told to End Pollution

MOUNT PLEASANT, Tex.—Operators in two large northeast Texas oil fields last week received a stop-pollution ultimatum from the Texas Railroad Commission.

A commission investigation had disclosed that operators in Pewitt Ranch and Talco fields were running 10,000 to 15,000 bbl. of salt water a day into White Oak Creek, the Sulphur River, and Texarkana Reservoir.

The commission's order outlaws storage of salt water in surface pits and compels the operators to inject all produced salt water into underground formations not productive of fresh water.

This must be done by March 1. If it is not, the commission will shut in oil production from any erring lease until the owning operator conforms to the order.

Commission approval must be obtained for each salt-water disposal plan prior to water injection.

More Lines Coming

Pipeliners told Mid-East troubles mean bigger year

BOCA RATON, Fla.—Pipeliners laid 10 per cent more pipe tonnage in 1956 than they did in 1955. And an even bigger construction year is coming up.

This was the prediction of Clark C. Bledsoe, retiring president of the Pipeline Contractors Association, at the group's ninth annual convention.

Bledsoe, of Midwestern Constructors, Inc., revealed that total value of lines laid by association members in 1956 was $175,000,000, an increase of $19,000,000 over 1955.

Profits per job during those years, however, were smaller than they were in 1954, Bledsoe said. He explained it this way: Efficiency in stringing pipe has been going up. But so have costs for material and labor. And prices for laying large-diameter pipe haven't changed.

Uncertainties in the Middle East were credited by Bledsoe for the brighter construction outlook in 1957. These same uncertainties could lead, in the opinion of Texas Railroad Commission Chairman William J. Murray, Jr., to building of the world's longest crude line. Murray predicted a continuous line will be built from the Middle East to Europe.

New officers . . . James P. Neill, Western Constructors, Inc., of Dallas, was elected president of the association for 1957. Other officers were:

R. P. Gregory, Houston Contracting Co., of Houston, 1st vice president; M. S. Williams, Panama-Williams Co., Houston, 2nd vice president; and Robert O. Sheehan, Sheehan Pipeline Construction Co., Tulsa, treasurer.

New directors are Bledsoe; Robert A. Conyes, Conyes Construction Corp., San Pablo, Calif.; Gregory; E. G. Morrison, Western Pipeline, Inc., Austin; and James W. Sharman, of Sharman, Allen, Gay & Taylor, Houston.

Let's be partners, report asks . . .

Canadians Seek Equity In Oil

OTTAWA.—U. S. companies may be asked to take Canadian partners into their Canadian oil operations.

This is one of the suggestions of the Gordon Royal Commission in its recent report to the federal Canadian cabinet. The commission was established 2 years ago to study Canada's economic future.

The proposal is one of two methods which the commission said might induce investors in Canada's natural resources to share at least 20 or 25 per cent of the equity of their Canadian businesses with Canadians.

Proposed tax concessions would apply only to Canadian companies or to foreign-owned Canadian subsidiaries whose parent companies are prepared to sell a part of equity stock to Canadians and appoint independent Canadians to boards of directors.

Tax changes would:

. . . Allow deduction from income for tax purposes, the cost of acquiring unproductive properties—a deduction now permitted in the United States. This would apply to Canadian companies or foreign companies with Canadian participation.

. . . Adopt the U. S. depletion allowance system of computing allowance as a percentage of gross profit, or provide a lower tax rate for profits from oil and gas. In Canada, all expenditures on exploration and development must first be deducted from taxable income.

The report also suggests that a larger proportion of foreign investment in Canada should be in bonds.

The future . . . Looking ahead, the commission estimated that oil will provide about 45 per cent of Canada's total energy requirements by 1980. Gas would provide 25 per cent; coal 16; water power 11; nuclear energy 2; and wood 1 per cent.

It seems probable, the commission added, that the United States will continue to look favorably upon programs for increasing the existing oil reserves in Canada, because of the proximity of the two nations.

"We believe also that the long-run prospects for the production of oil in Canada, and for exports to the United States are promising," the report said.

The commission pointed out, however, that there "is a recurrent threat of official or unofficial quota restrictions on crude petroleum and a prohibitive tariff on refined products" in the United States.

Trans-Canada Plans Busy Year

BOCA RATON, Fla.—Trans-Canada Pipe Lines, Ltd., expects to have 1,300 miles of its 2,250-mile natural-gas line in the ground by the end of 1957.

This will entail more than 1,000 miles of construction this year.

Construction plans were outlined last week in a speech prepared for delivery before the Pipe Line Contractors Association by Charles S. Coates, executive vice president and general manager of Trans-Canada. The remarks were read by J. L. Parrish, chief engineer of Trans-Canada, as Coates was unable to attend.

Some 230 miles of the 574-mile Alberta-Winnipeg western leg has been laid. Contracts have been let on the remainder. The route has been cleared and graded and pipe is being strung during the winter construction shutdown. Because of the soil conditions, construction may not be resumed until June 1. Gas service to Winnipeg is expected to be available in August or early September.

The Alberta-to-Montreal line will be 34-in. to Winnipeg, 30-in. from Winnipeg to Toronto, and 20-in. from Toronto to Montreal. Pipe scheduled for delivery this year includes 395 miles of 30-in., 33 miles of 24-in. (for the takeoff running south from Winnipeg to the U. S. border to supply Midwestern Gas Transportation Co.), and 310 miles of 20-in.

Construction timetable . . . The 30-in. section is to be taken from Winnipeg to Port Arthur, Ont., at the head of Lake Superior, this year.

The Toronto-Montreal leg, which would be supplied by Tennessee Gas Transmission Co. pending completion of the all-Canadian line, is also scheduled to be built this year. The Toronto-Port Arthur gap is to be bridged in 1958, making Alberta gas available all along the system by the fall of next year.

Two vital events in Trans-Canada's immediate future are completion of financing and a ruling by the Federal Power Commission on the export-import proposals of Tennessee Gas and its subsidiary, Midwestern.

"This export is not essential in the initial financing," Coates said, "but it will play an important part in the development of the Trans-Canada system."

Tankers Get Boost

Record orders in December include 100,000-ton models

ORDERS for more than $400,000,000 worth of tankers were placed with United States shipyards last month, making it the best since the end of World War II. The orders covered a total of 28, all but four of which will be of 40,000 deadweight tons or more.

This raised the total on order as of January 1, to 70 tankers, aggregating 2,848,645 deadweight tons, according to the Shipbuilders Council of America. The price tag on the lot is approximately $750,000,000.

December's orders included two of 100,000 tons, both to be built by the Onassis group. All but five of the tankers ordered in December were placed by the so-called independents. The only oil company to place an order was Esso Shipping Co., which concluded arrangements with Newport News Shipbuilding & Dry Dock Co. for five 46,000 ton tankers.

Three tankers were launched in December, one of 32,650 tons for Cities Service Co., the "Cities Service Norfolk," and two for the Military Sea Transport Service.

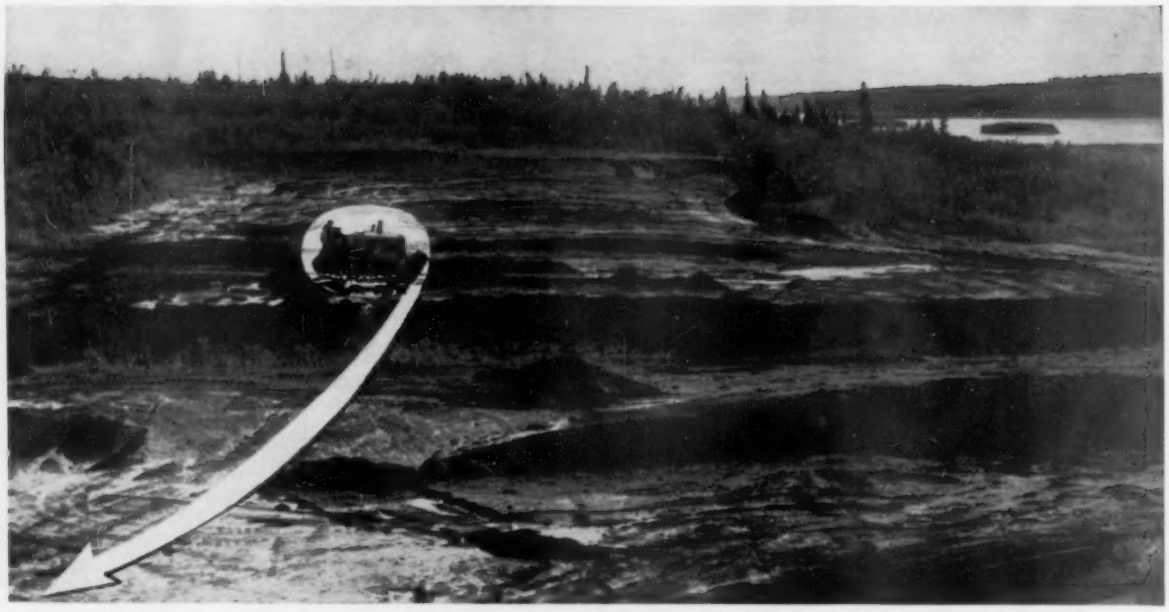
Another 100,000-ton tanker is under consideration by National Bulk Carriers. It would build it in the Imperial Japanese yards at Kure, which it now operates. These yards are the largest in the world but, since they are booked to capacity for some time, it appears that the U. S. will build the first of this size. It will be the world's largest ocean-going vessel.

Offshore Court Fight Ends

LONG BEACH.—Geologist H. A. Hansen's latest move in his 14-year fight for the right to develop Long Beach's potentially oil rich offshore submerged lands ended unsuccessfully last week.

Hansen filed suit against the city in Superior Court last November charging he was given the rights to develop the city's estimated $4-billion offshore reserves in a 1942 City Council resolution.

This maneuver didn't get off the ground. Superior Court Judge Charles T. Smith threw out the suit by ruling the Seal Beach geologist failed to establish enough facts to support a cause of action.



Dozer piles up the "oil" as . . .

. . . Royalite Taps Athabasca Tar Sands

● After years of trial and error, centrifugal separators are opening the door to development of the world's largest known oil deposits.

CALGARY. — Gordon Coulson's "washing-machine" method of extracting oil from what is believed the world's greatest oil reservoir has evolved into a $50 million development program.

Royalite Oil Co., Ltd., will build a processing plant in the heart of the rich Athabasca tar sands at Mildred Lake, about 250 miles northeast of Edmonton. It involves a 4-year building program, with work scheduled to start this spring

The big project will end 2 years of research in the development of the Coulson centrifuge process, which spins the sand from the oil within a cylinder.

The new process is the brain-child of Gordon Coulson, a Calgary building contractor who first tried the idea in his wife's spin-dry washing machine, during experiments in his basement about 6 years ago. He came up with the method after scores of other attempts had failed to process the oil sands economically.

Here is what Royalite proposes to construct:

. . . **A separation plant** on a 50,000-acre lease which is conservatively estimated to hold one billion barrels of oil.

. . . **A 20,000-bbl. processing plant,** which will include a coker and desulfurization plant.

. . . **A 250-mile pipeline** to Edmonton.

. . . **Townsite to accommodate** an estimated 1,400 persons in the sparsely populated country.

Royalite President Ray Althouse said the entire project will be in operation in 1960. The first summer's work will consist of building warehouses, garages, offices, machine shops, and housing accommodations.

Processing and separator equipment will be installed in 1958, and the pipeline will be laid in 1959, he said. Contract for the program was awarded to Caribou Engineering Co., Calgary.

Here is how the development will work:

. . . **Earth-moving equipment** will be used to scoop up the oil "tars" of the McMurray formation which is found just below the surface, in layers up to 200 ft. thick.

. . . **Raw material** will be transported to the separation plant on the banks of the Athabasca River where as many as 50 giant centrifuges will separate the oil, sand, and clay.

. . . **Waste sand will be pumped** out to pits in the low-lying flats along the river. This waste sand is a glass sand, holding approximately 20 different minerals including vanadium.

OIL SAND is weighed prior to test during last summer's experiments. The truckload of raw material is headed for the hopper of the pilot plant at Bitumount, where the oil is separated from the sand through centrifugal force.

. . . **After separation,** the 7°-gravity oil will be transferred to a nearby processing plant where it will undergo a coking process. The resulting coke will be used as plant fuel.

. . . **Desulfurization** will be the next step. The sulfur plant will produce about 140 tons daily.

. . . **The resulting 20°-30°-gravity** oil will then be sent to Edmonton via pipeline for further processing.

Centrifuge principle . . . Coulson's centrifuge process was patented in 1953. Can-Amera Oil Sands Development Co. was formed to raise money and carry out the experiments.

A 50-bbl. centrifuge was built by De Laval Separator Co., Poughkeepsie, N. Y., and installed at Bitumount, site of a government pilot plant about 30 miles north of Mildred Lake. The experiment was successful and De Laval built a 500-bbl. centrifuge in 1954.

The following year, Can-Amera entered into an agreement with Royalite, an integrated oil firm with 450 retail outlets in western Canada. The joint operation at Bitumount resulted in a remodeled centrifuge which overcame the serious problem of abrasions.

The units can now be made to produce as much as 5,000 bbl. of oil per day, operating continuously with a minimum of attention and service. Cost of operating the machines will be a few cents per barrel, Royalite officials say.

Extent of reserves . . . Since the oil-soaked sands were first recorded in 1788, they have been considered an oil wonder of the world. They rank as the largest known reserve of oil.

Estimates of the geographical extent of occurrence range from 8,000 to 30,000 sq. miles. Reserves are estimated at 100 to 300 billion barrels.

The sands are exposed on the banks of the Athabasca River some 30 miles north and south of Mildred Lake. The Indians used the "tar" to gum their canoes.

Hot and cold washing . . . In the 1920's the Research Council of Alberta built two small pilot plants in Edmonton, using the hot-water wash method to extract the oil.

Subsequent government and private experiments were conducted on the Clearwater River near Waterways, at Bitumount, and near McMurray, which is about 30 miles south of Mildred Lake. Both cold and hot-water wash were tried, and proved uneconomical.

The washing methods produced a "clean" sand, but did not separate minute particles of fine sand, clays, and water which remained in the oil.

In 1951, Coulson, whose experiments were his hobby, filled two glass jars with oil sand and water, and placed them in his wife's washing machine. The result was a clean separation—a layer of oil on top, a clean layer of water, and a layer of relatively clean sand on bottom.

——*Industry* briefs

The oil and gas division of the Texas Railroad Commission may get a bit more spending money during the next 2 years.

The Texas legislature's Legislative Budget Board has recommended division budgets of $1,396,062 for the coming year and $1,382,272 for the following year. The recommended figures compare with $1,255,751 and $1,255,926 for the current biennium. The Texas fiscal year begins each September 1.

A helicopter survey of 100,000 sq. miles of terrain in the Upper Mackenzie River area of the Northwest Territories is to be undertaken this year. Object is to determine the region's oil and gas potential. George Prudham, federal minister of mines and technical surveys, said the work is expected to start in May.

After 65 years, United States Rubber Co. is getting out of the wire and cable business. The firm will sell its wire and cable department to Kaiser Aluminum & Chemical Corp., effective February 1. This will include the plant at Bristol, R. I.

Pure Oil Co. will move its Rocky Mountain division office from Billings, Mont., to Denver this summer. About 55 engineers, geologists, accountants, and other production personnel at Billings will be affected.

The Billings office supervises Pure operations in Montana, Wyoming, North and South Dakota, northwestern New Mexico, Utah, and western Colorado.

New Mexico's production allowable for February has been boosted to provide for sale of 3,000 bbl. of San Juan basin crude daily to Standard Oil Co. of California. The new unit allowable was set at 43 bbl. daily, up 1 bbl., for basic unit production.

Socal is buying the crude from El Paso Natural Gas Co. and is reportedly paying $1.20 to $1.50 a barrel over the price of California crude. It will be processed at California Standard's 120,000-bbl. El Segundo, Calif., refinery.

Magna Oil Corp. and Johnson Ranch Royalty Co. will merge on a share-for-share basis with Magna becoming the surviving company. Officers of the two firms have approved the merger. Stockholders will vote on the plan later this month at separate meetings in Dallas.

U. S. Budget Like Topsy

Government will increase its expenditures for oil and gas purchase and administration 9½ per cent next fiscal year

WASHINGTON.—The federal Government will spend $800,000,000 for oil and gas purchase, regulation, research, and management during the fiscal year which begins next July 1.

This amount, an increase of some $70,000,000 over the present level of spending, is part of the $71.8 billion budget sent to Congress last week by President Eisenhower.

The cost of Government will increase $2.9 billion, Eisenhower said. But government receipts are expected to increase $3 billion. The result will be a $1.8 billion surplus on June 30, 1959—provided prosperity continues and Congress doesn't go off on a spending spree.

The tight balance between costs and income will leave no leeway for tax reductions this year. Eisenhower called for another year of the 52 per cent corporation tax and the wartime increases in excise levies. But he urged that relief be given small business, without substantial loss of revenue.

The greater part of the increased bill for oil is represented by the cost of fuel for the Navy and Air Force. More money will be needed for the oil and gas operations of the civilian agencies, too.

Oil-industry taxes . . . But the latter is more than offset by the nearly $2 billion which will be collected in oil taxes and royalties.

The Treasury estimates that revenue from oil and gas, aside from income and corporation taxes, will increase nearly $200 million in the coming fiscal year.

Receipts from the gasoline tax are expected to be $1,693,000,000 against an estimated $1,521,000,000 this year. There will be no change in the take from the lubricating oils tax—$75,000,000. The tax on pipeline transportation will bring in $40,000,000 against $38,000,000, and diesel fuel will provide $38,000,000 against $35,000,000.

Aside from the gasoline tax, the biggest revenue will come from royalties on oil and minerals from the government's lands. A total of $148,794,000 is expected to be collected, against $144,188,000 this year.

Here is how the spending breaks down according to departments, bureaus, and offices:

. . . Interior Department will spend more than $24,000,000 on oil and gas research and management in 1958. This will be an increase of more than $2,500,000 over current funds.

It will cost $585,000 for the expanded activities of the Office of Oil and Gas, an increase of $71,200 over this year. The office's normal work of coordinating the oil and gas activities of the federal Government will use $385,400 of this, against $366,400 this year.

The remaining $199,600, an increase of $52,200, is to go for a larger force of inspectors and enforcement of the Connally Hot Oil Act. The additional staff is needed because of the increasing number of fields and leases.

. . . Bureau of Land Management will get an increase of nearly $4,000,000, for a total of $22,220,000. This will include a fund of $5,722,400 for the lease and disposal of lands and resources, for which $5,300,400 is now provided.

As in the case of a $1,800,000 increase given this year, the additional money is to help the bureau catch up on its workload. But the budget figures estimate the bureau will be able to do no more than handle the 145,000 new and reactivated cases it is expected to receive. This year, the bureau hopes to reduce its backlog from 78,000 to 70,000 cases, but does not expect to get below that figure in fiscal 1958.

. . . Geological Survey is scheduled for an increase of $7,000,000, giving it $38,775,000. This will include $8,400,000, against $6,778,000 this year, for geologic and mineral resource surveys and mapping.

The survey is also to get $2,155,000 for supervision of oil, gas, and mining leases, against $1,943,000 this year. It will have supervision over approximately 160,000 leased properties which are expected to produce oil, gas, and minerals valued at $665,000,000 and return royalties of some $72,000,000 to the Government.

. . . Bureau of Mines would receive $19,575,000 for 1958, against $15,862,750 this year. Its research on oil, gas, and shale will cost $2,523,000 against $1,803,000. But this figure still will be less than the bureau had for this work—$2,822,360—in 1956.

The bureau gets a special program for its helium operations, not included in its general funds. The cost of operating the helium properties in 1958 will be $3,614,682 against $3,258,914 this year. This cost will be more than recovered from the sale of helium, primarily to the military forces and the Atomic Energy Commission. Sales are expected to bring in $4,829,500 against $4,748,550 this year.

The bureau will spend $3,330,700 for new facilities on which it is expending $4,009,000 this year.

. . . Naval petroleum reserves would require $1,000,000 for administration, against $683,000 this year. Most of the fund, $851,000, will go for work in the Elk Hills reserve. No money is provided for any work on the naval shale reserves, but the Navy Department is expected to ask Congress to permit it to reopen the research plant at Rifle, Colo., formerly operated by the Interior Department.

. . . Military services do considerable research on fuels and lubricants. But the big oil items in their budgets are for fuels for operation. The Navy Department figures that fuel for ships will cost $116,963,000, against $104,850,000 this year. The Air Force puts its aviation fuel cost at $640,000,000 against $585,000,000.

. . . Federal Power Commission is asking for $5,900,000, against $5,225,000 this year. The cost of regulation and surveys of the natural gas industry is placed at $2,751,900 against $2,362,500. The increase of $389,000 is the first substantial advance given the FPC since it took over the job of regulating independent producers in 1954.

The FPC now regulates 111 pipeline companies with operating revenues of $3 billion and approximately 5,000 independent producers, the budget reported. It is estimated that pipelines and producers will file approximately 5,900 rate applications this year and 4,700 in 1958. Certificate applications are expected to remain at the present level of 412 from pipelines and 1,029 from producers.

. . . Federal Trade Commission is seeking funds to broaden its antimonopoly activities. It has $2,583,300 for this now and is asking for $2,700,950. A year ago the FTC asked for $2,798,600, but was cut back by Congress.

. . . Justice Department is also set down for an increase from $3,568,650 to $3,785,000 for antitrust law enforcement.

Royalty Change Advocated

DENVER.—A bill proposed before the Colorado Senate would give a break to surface owners or purchasers of school lands sold by the state since 1919. It would allow them a 2½ per

cent royalty on any oil or mineral production.

The owner or purchaser of such lands now receives nothing in mineral royalties. The state reserves the 12½ per cent royalty when it sells the lands. The proposed royalty is designed to pay the surface owner for inconvenience caused by drilling.

Colorado Test Hits

Conoco strike opens first Las Animas oil production

DENVER. — Continental Oil Co. opened the first commercial oil production on southeastern Colorado's elusive Las Animas arch last week at 1 Lynn in Kiowa County.

The important well pumped 240 bbl. per day from the Marmaton-Pennsylvanian at 4,232-54 ft. This is a rework discovery, having been completed last year by D. D. Harrington as a Pennsylvanian gas discovery for 3,420 M.c.f. per day. It is just southeast of Southwest Eads field, a shut-in 1952 Continental gas discovery.

The Lynn oil discovery is the first big development on the Las Animas arch, which separates the Denver and northwestern Anadarko basins, since Bents Fort field was opened early in 1956.

Two other gas fields were opened last year, one at Colt and one at Lubers. It was the Bents Fort oil discovery that set off a flurry of wildcatting during 1956.

Continental's new oil strike, appearing to be the best success on the arch yet, raises hopes for production on the east side of the arch, where a complete section of Paleozoic rocks is present. A stepped-up search for strat traps can be expected here this year.

Pipeline briefs

Ohio Fuel Gas Co. will build some 170 miles of pipelines, primarily 18, 20, and 24-in., to increase deliveries of natural gas to Ohio customers this year. Contracts have not been awarded for the construction, most of which is due for completion during the last half of 1957.

Leonard Crude Oil Co. has started operating its extended gathering line which has given Reynolds and Stanton fields of Michigan their first pipeline outlets. Completion of the 31-mile, 4 and 6-in. extension to Reynolds field will make possible an increase in production to 1,500 bbl. per day from the 1,000 bbl. which was being hauled by truck. The crude is pumped to the Crystal station of Michigan-Ohio Pipeline Corp. It was formerly trucked to Newaygo.

Interstate Oil Pipe Line Co., subsidiary of Standard Oil Co. (N. J.), has budgeted $5,500,000 in capital expenditures for 1957. More than $1,000,000 has been earmarked for four separate products lines from Esso Standard Oil Co.'s Baton Rouge refinery to the Sorrento, La., petrochemical center. Crude system expansions also are planned.

Michigan Consolidated Gas Co. expects to spend $31,200,000 on new construction this year. The company will expand its transmission and distribution system by some 400 miles to increase deliveries made possible by the completion of American Louisiana Pipe Line Co. from Louisiana to Detroit. Gas available from American Louisiana increased Michigan Consolidated's supply by 70 per cent.

Altgelt Construction Co., Inc., has received the contract for 100 miles of 3, 4, 6, and 8-in. gathering lines in the Corpus Christi, Tex., area for Texas Eastern Transmission Corp. These lines will supply the 422-mile, 30-in. line which Texas Eastern is building from McAllen, Tex., to Beaumont.

Altgelt also is constructing gathering lines as field developments warrant for the Wilcox Trend Gathering System, Inc., in the lower Rio Grande Valley. Wilcox Trend will be linked with the new Texas Eastern line by a 45-mile, 24-in. lateral.

Pontiac Eastern Refining Co. has awarded Altgelt the contract to build 38 miles of 8-in. products line and 12 miles of 10-in. crude line in Mississippi.

R. H. Fulton & Co. is scheduled to start welding pipe this week on a 73-mile, 20-in. spread for Pasotex Pipeline Co. between Wink and El Paso, Tex. Right-of-way work was under way last week. The project is expected to be completed early in April. It's part of a Pasotex program to complete the 195-mile, 20-in. link along its existing El Paso-Wink system.

Gulf Refining Co. is moving ahead with construction of an L.P.G.-natural gasoline line from West Texas to the Houston area. Panama-Williams Corp. has the contract to take up and recondition 57 miles of 10-in. between Ranger and Roscoe. Construction of 27 miles of 10-in. on the Houston end of the project and 46 miles of 10-in. from Waddell to Midland is already under way. Panama-Williams also has the Waddell-Midland spread.

Also for Pipeliners . . .

El Paso Natural Gas will become the world's biggest pipeline as result of a stock exchange deal with Pacific Northwest Pipeline Corp. (P. 58) . . . President Eisenhower comes out for a new natural-gas bill to free producers of Federal Power Commission control (P. 61) . . . A member of the Federal Power Commission outlined a plan for the Pipe Line Contractors last week that would see products and crude-oil lines also fall under government jurisdiction (P. 64) . . . The outgoing president of the Contractors Association sees more construction in 1957 than in 1956 (P. 64) . . . Trans-Canada expects to have 1,300 miles of pipe in the ground this year (P. 65) . . . The FPC has ruled a producer may withdraw his application to sell to a pipeline if the commission has not acted on the case (P. 72) . . . Transatlantic line linking Canada and England studied (P. 73) . . . Flow through I.P.C. lines could start a week after repairs are under way (P. 77).

PLUS THESE TECHNICAL FEATURES: An expert looks at four areas of submarine pipelining and analyzes the problems of each (P. 104) . . . and Pipeline Patrol's construction tables (P. 127).

S.A.E. Spots Motor Trends

Getting efficient small engine balks spread of gas turbine to passenger cars; fuel injection has greater possibility

DETROIT.—Reports on two trends in new-motor development were handed the Society of Automotive Engineers last week. The experts say:

... **The gas turbine** as a power plant for passenger cars still is far over the horizon.

... **Fuel injection** is opening up greater possibilities but it also still has some big hurdles to jump before becoming popular.

... **Atomic power plants** for passenger cars are out of the question. Weight of engine required makes it impractical on basis of presently known principles.

These conclusions were drawn from addresses to the society by men engaged in motor development and from corridor talks.

During the 4-day convention, delegates heard 45 technical papers on every phase of automotive and allied engineering. The program also included three symposiums.

Trouble in turbines . . . The big problem in gas-turbine research boils down to this: The big engines achieve great efficiency. But so far, getting the same efficiency in smaller engines has eluded researchers.

"The small gas turbine is similar and yet different from its larger brother," Sumner Alpert of Solar Aircraft Co. declared. "Too often a small gas turbine designed by scaling down data from larger units has failed to live up to expectations."

Solar developed its first hand-started gas turbine 8 years ago. It drove an emergency fire pump. Since then it has been adapted to more advanced pumps, generators, and compressed-air sources. But although gradually and vastly improved, it still poses many problems.

One problem is combustor life. The elbow-type combustion chamber in Solar's 50-hp. gas turbine is essential for compactness. It's admittedly far from ideal for combustion, however. Life of the present combustor ranges from 170 to 475 hours, averaging 250 hours. Solar also has a 500-hp. gas turbine.

Free throttle best . . . Gas turbines show to greatest advantage in free-throttle operation.

Boeing Aircraft's Wallace E. Skidmore listed aircraft, boats, trucks, and busses as ideal applications. Significantly he made no mention of the passenger car.

Skidmore noted some progress ahead: "Overhaul life and cost in production quantities are approaching those for reciprocating engines." He said the cost of Boeing's Model 502-10C engine is now $7,500 each at a manufacturing rate of 50 per month.

Skidmore rated the Model 502-10C as the "most straight-forward and least complicated arrangement of the gas turbine known today." He also underscored Boeing's progress with the engine. Horsepower has doubled, 120 to 240. Specific fuel consumption has decreased from 1.8 lb. per horsepower-hour. But weight has gone from 220 to 320 lbs.

What's ahead for injection? . . . Cost is the greatest barrier fuel injection faces at present.

Sharp reduction in the cost will be necessary before fuel injection is generally adopted. But engineers at General Motors, first to offer a system in passenger cars, are convinced they're moving in the right direction.

They report fuel injection "opens the door to a new potential of advancement not possible with the conventional carburetor." These experimenters add one word of warning: Keynote in the future for fuel-injection designs should be simplicity.

General Motors engineers, however, point out the progress they've made. Their first design adapted from aircraft principles was about eight times as expensive as the carburetion system.

The General Motors' fuel-injection system employs a method known as mass flow metering. Heart of the system is a high efficiency venturi. Air flow through the venturi controls the venturi signal and maintains a constant air-fuel ratio.

This ratio can be varied between wide open and part-throttle operation. Only action needed is changing the linkage lever between the control diaphragm and the spill plunger. In automatic operation the lever is controlled by the spring loaded enrichment diaphragm. It in turn is subject to manifold vacuum.

Spectacular tests . . . General Motors reported startling results from tests of injected and carbureted engines of identical power.

The comparison showed a "spectacular increase in vehicle performance due to ability of fuel injection to maintain best power mixtures."

The engineers also got a run-down on Bendix Aviation's electronic fuel injection system. It was described as a "modulating and sensing means for controlling the fuel flow to an engine under all engine-operating conditions."

The electronically controlled, electrically actuated system responds to:

- ... **Inlet manifold pressure sensor.**
- ... **Deceleration cutoff sensor.**
- ... **Starting enrichment control.**
- ... **Idle mixture enrichment control.**
- ... **Altitude compensator.**
- ... **Accelerator enrichment control.**

Peculiar advantages are claimed for the electronic system. It eliminates the expensive and complicated high-pressure metering pump, has fewer moving parts, and requires no special pump drive from the engine.

There are no critical filtering requirements, no surge or inertia effects as in a pulsating high-pressure fuel line, and no vapor lock. The system is easily adapted to assembly-line installation, has low electrical requirements and requires no ultraprecision machining standards.

Bendix engineers admit the millennium for fuel injection still is in the future. "We are conscious," they say, "that this is a new concept in fuel metering and poses new and different problems."

No atoms for cars . . . There's no possibility of direct nuclear propulsion of autos or trucks—unless a completely new and revolutionary principle is discovered.

Dr. Clayton R. Lewis, Chrysler Corp.'s chief engineer for nuclear research, gave that estimate to the S.A.E. nuclear advisory committee. He added, however:

"Indirect propulsion of automobiles from nuclear-generated power would be very attractive. Such an invention would, in all probability, completely change the automobile and allied industries as we know them today."

Dr. Lewis said it would take an 80,000-pound atomic power plant to propel a 3,000-pound automobile. And he said this weight ratio was only "an optimistic estimate."

Atomic energy, however, does have an immediate interest to automotive engineers. Dr. Lewis said it appears likely there will be greater demand for hauling highly radioactive fuels and components. This will require vehicles heavily shielded to protect the public. In some cases the vehicles must be refrigerated to dissipate heat generated from the radioactive material.

Drilling Firm Formed

Prince Marine takes over assets of Prince Drilling

HOUSTON—The newly organized Prince Marine Drilling & Exploration Co. has purchased assets of Prince Drilling Co., Houston.

Z. C. Ambrose, president of the new firm, said the purchase included two submersible inland drilling barges of about 16,000-ft. capacity, two land rigs with capacity of about 12,500 ft., boats, and other equipment. Also involved were three oil wells and 13 gas wells in six Texas fields.

Ambrose also announced that Dewey K. Davis, former drilling superintendent for Penrod Drilling Co., has joined Prince Marine as vice president and general superintendent.

Stock owners . . . The president of Prince Marine is also assistant president and a vice president of Associated Oil & Gas Co., which owns about 44 per cent of the drilling firm's outstanding stock. H. J. Mosser, president of Associated, and David C. Bintliff, vice president, are both directors of the new company.

Other directors are H. V. Sherrill, a partner in Shields & Co., New York, which owns about 19 per cent of Prince Marine's outstanding stock; Jack G. Taylor, an executive with David C. Bintliff Interests, Houston; A. Knox Tyson, president of Slick Oil Co.; C. R. Williams, vice chairman of the board of Pacific Northwest Pipeline Corp.; and John H. Wimberly, president of Houston Natural Gas Co.

Western, Cameron to Merge

HOUSTON.—Plans for merger of Cameron Parish Corp. into Western Natural Gas Co. were announced last week.

Paul Kayser, president of Western Natural, said the agreement would involve issuing 800,000 shares of Western's common stock for all stock in Cameron. Cameron, with headquarters in Chicago, has production payment from royalty interests in South Louisiana valued at $10,454,000. The company also has a participating interest in several exploration projects in Louisiana.

Myron Ratcliffe, president of Cameron, said the company's production payment now amounts to $120,000 monthly. This income, Kayser pointed out, will help Western Natural pursue its exploration and development programs in Canada, the San Juan basin, and both onshore and offshore in Louisiana.

Western Natural is an affiliate of El Paso Natural Gas Co., which owns about 23 per cent of its outstanding common stock.

The agreement with Cameron is to be submitted to stockholders of both companies in February.

Colorado Case Reset

Quorum is essential, court says in ruling on B-A suit

DENVER.—British-American Oil Producing Co. has forced the Colorado Oil and Gas Conservation Commission to conduct hearings with a quorum of its members present.

British-American obtained a temporary restraining order in Denver District Court preventing the commission from enforcing a December 12 order limiting oil production to 200 bbl. daily from wells in Logan County's Beall Creek field.

The firm questioned validity of the order, claiming it was denied a proper hearing in December when only two of the commission's five members heard testimony on which the order was based.

The company said its two wells in the field are "phenomenally good," with one producing about 1,000 bbl. daily.

British-American later agreed to dismissal of the injunctive action after the commission withdrew the order and promised to hold future hearings with a quorum of its members present. The commission scheduled another hearing on Beall Creek field production January 23.

The original commission order stated uncontrolled production in the field caused waste and abused correlative rights of owners because of nonuniform withdrawal.

Texas Oil-Fund Plan Opposed

AUSTIN.—Texas educators have voiced strong opposition to a proposal to divert income from the state's Permanent University Fund to care for current operating expenses of the University of Texas and Texas A.&M. College.

The permanent fund is made up of all income from leasing bonuses and oil royalties on university lands. Under current law, these funds cannot be spent.

The proposal was made as a measure of providing relief to Texas taxpayers. It drew fire, however, from the University of Texas board of regents and the Texas A.&M. College System board.

Texas Company Sold

● Another chemical firm joins trend of buying oil for raw material

CORSICANA, Tex.—Hydrocarbon Chemical Co., Newark, N. J., has joined the chemical-industry rush to round up oil raw material.

The Newark firm has acquired the producing and pipeline properties of Coffield & Guthrie, Inc., of Rockdale, Tex., long-time independent operator.

Exact purchase price was not disclosed. But a Coffield & Guthrie official told The Journal that the deal involved between $3,000,000 and $4,000,000.

The chemical company through the purchase will acquire about 2,000 bbl. of oil production daily in East and West Texas and about 80 miles of 2 to 6-in. gathering lines.

Hydrocarbon Chemical has set up two new affiliates to take over operation of the properties:

. . . Southwestern Hydrocarbon Co. will be in charge of oil production.

. . . Southwestern Hydrocarbon Pipe Line Co. will operate the gathering systems. Both are headquartered at Corsicana.

Paul Belmont is president of the two new firms. Bert Guthrie, son of W. S. Guthrie, one of the former owners, is vice president.

What's involved . . . The great bulk of the Coffield & Guthrie production was in Corsicana Shallow field of Navarro County. This was the first commercial oil pool in Texas. There, Southwestern Hydrocarbon will take over 600 wells now producing about 50,000 bbl. of oil a month.

The new company will acquire another 55 wells producing about 7,000 bbl. a month from Canyon Reef fields in Scurry, Mitchell, and Howard counties in West Texas.

Most of the gathering lines taken over by the new pipeline firm also are in this area. The West Texas system gathers oil from fields in Scurry, Mitchell, and Howard counties and feeds it to Cosden Petroleum Corp.'s refinery at Big Spring, Tex., in Howard County.

Partnership split . . . Effective date of the sale was January 1.

H. H. Coffield and W. S. Guthrie, former owners, meanwhile have dissolved partnership. Coffield has not announced future plans.

Guthrie plans to stay in the business. He retains separately owned production plus two drilling rigs and four well-servicing units.

FPC Avoids Contract Row

● Commission holds in Gulf-American Louisiana case gas producer may withdraw but legality of move up to courts

WASHINGTON. — The Federal Power Commission has sidestepped legal issues involved in a contract controversy between Gulf Refining Co. and American Louisiana Pipe Line Co.

Upshot of the FPC ruling is this:

. . . **A gas producer** may withdraw his application for certificate of sale if FPC has not yet acted on it.

. . . **Legality of the contract** cancellation is a private controversy between the parties. The courts must pass on it.

The FPC explained there is no authority in the Natural Gas Act requiring a producer "to seek or accept a certificate."

The controversy arose when Gulf Refining cancelled contracts to supply gas to American Louisiana. It claimed time conditions spelled out in the contracts had not been met.

What's involved . . . The commission unanimously approved withdrawal of three contracts under which Gulf Refining proposed to sell gas to the pipeline firm.

But action on the fourth application was held up by a 3-2 vote. The commission asked to study American Louisiana's claim that this contract was still in effect.

Dissenting commissioners, Seaborn L. Digby and William R. Connole, argued that the commission had no authority to hold the application. Under the law, they asserted, it must permit withdrawal of an application if the sale has not begun and if it is not otherwise under the commission's protection.

Gulf originally had five contracts calling for delivery of 100,000 M.c.f. daily. They provided a substantial part of the supply on which American Louisiana based a $16,078,000 expansion program to boost its daily delivery capacity from 300,000 to 400,000 M.c.f. daily.

American Louisiana since the cancellation order has bought 180 billion cubic feet of reserves to replace the loss *(The Oil and Gas Journal, December 3, 1956, page 78).*

A time clause . . . The four contracts which Gulf asked to withdraw carried a provision permitting either party to cancel if the FPC did not approve the deal in 6 months.

Hearings on the Gulf-American Louisiana applications opened before the FPC November 14. The following day Gulf announced that the conditional period had expired and filed a motion to withdraw.

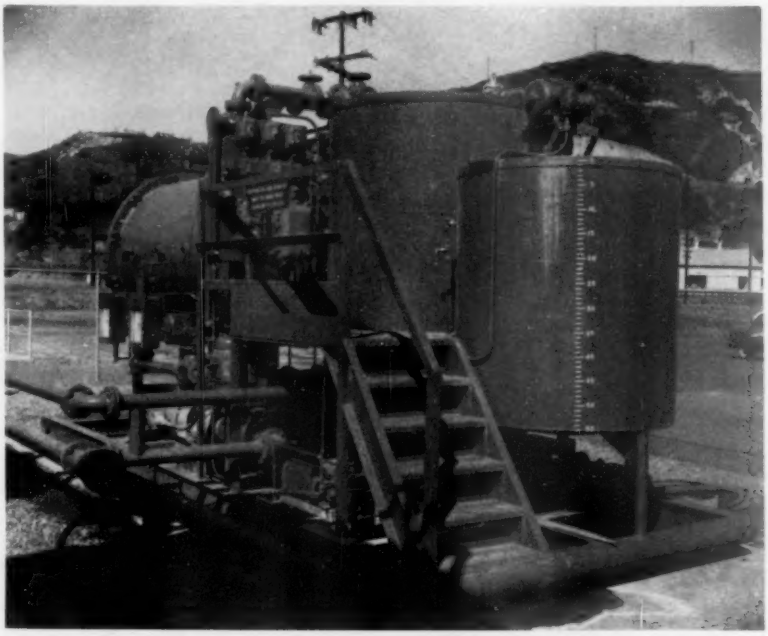
The three applications which Gulf has been allowed to withdraw were for gas from the Church Point, Hayes and Washington fields in Louisiana. The application held up is for gas from the Krotz Springs field in Louisiana. American Louisiana filed a motion opposing cancelling it. The pipeline claimed that the Krotz Springs contract was still in effect. No such claim was made for the other three contracts.

The issue . . . The FPC order made it clear the only question for it was whether withdrawal should be allowed.

"It is not within our province to determine the legal issues presented in the private controversy between American Louisiana and Gulf as to the continued vitality of the gas supply contract here involved," the FPC stated.

Delay of action on the Krotz Springs contract, it continued, does not reflect any intention to pass on merits of the private controversy or to alter the legal rights of either party. But Gulf has not shown that it would be prejudiced in any way if its application is kept on file, the ruling said.

Digby and Connole claimed that if the courts hold the contracts will not permit cancellation but in fact still bind the parties, Gulf is bound under another provision to file for a certificate. There is no danger of Gulf's not refiling and thereby depriving American Louisiana of gas, they said.



Skid Adds Flexibility to Water Flooding

VENTURA, Calif.—If Shell Oil Co. ever halts its water flood in Ventura Avenue field it would be a simple matter to move the water-treating equipment elsewhere.

The 5,000-bbl. portable, skid-mounted water-treating plant can be picked up and hauled away in four truck loads leaving only the concrete slabs. It can be put back into operation at another location within 3 days with some advance site preparations.

The facilities include a 10-hp. centrifugal raw-water pump, two 180-bbl. tanks for filtered and unfiltered water storage, a 300-sq. ft. pressure leaf filter and a 40-hp. centrifugal injection pump.

All are skid mounted. Controls for maintaining a gas blanket inside the two tanks are mounted on the tank skids.

In addition to the main components, the unit includes a complete field laboratory for microbiological and chemical control.

Operation of the facility is entirely automatic except for manual controls used in backwashing the diatomaceous earth filter.

Transatlantic Line Linking Canada and England Is Talked

OTTAWA.—The Middle East shake-up has been the catalyst for a lot of revised thinking in the petroleum industry. But probably the biggest spin-off of all might now be on the fringes of reality.

The possibility of a transatlantic pipeline to link Canada with England is getting an unofficial look-in from Canadian and British scientists. And some pipeline experts are giving the idea more than a passing thought.

Such a project would be patterned after "Pluto," the flexible line laid across the English Channel to supply allied troops with fuel after the Normandy invasion. Route of the Canada-to-England system would presumably run through Iceland.

Sir Donald Banks, director of Britain's petroleum supply during World War II, is supporting the idea and urging that possibilities of the project be investigated fully.

"With political perils permanently menacing oil supplies from the Middle East," he declared, "it is becoming vitally important to secure other supplies. Another 'Pluto' could possibly be the answer."

A top Canadian research scientist said nothing has been done about such a proposal, but that it has been under discussion.

Arctic Test Near

Drilling equipment moving to Canada's far north area

EDMONTON.—A wildcat test of oil possibilities above the Arctic Circle will be launched soon by Peel Plateau & Exploration, Ltd.

During the winter months, the company has moved heavy drilling equipment up the Alaska Highway to its 8,000,000-acre concession in the Northwest Territories and the Yukon. The area lies south of Fort McPherson and is divided into two reservations: Half in the Northwest Territories and half in the Yukon.

Geophysical activities have been conducted on the holdings since the winter of 1953-54. Original plans called for sinking three wells with more to follow.

The equipment is being stockpiled at Flat Creek Landing, 40 miles south of Dawson City and 1,700 miles northwest of Edmonton. Later it will be hauled another 300 miles to the drilling site. Parker Drilling Co. of Canada will carry out the drilling.

Processing briefs

Union Oil Co. of California's more than 1,200 employes represented by the Independent Union of Petroleum Workers last week rejected the company's latest 18-month contract offer. The union cited differences in contract work clauses, union-membership clauses, grievance clause, bulletin board clause, holiday clause, and temporary assignment clause as the reason for the rejection. No date has been set for new negotiations.

British American Oil Co., Ltd., has let a contract to Lummus Co. of Canada Ltd. for construction of a 4,000-bbl. per day Catformer at its Edmonton, Alberta refinery. Construction is due to begin next summer for completion near the end of the year.

Shell Oil Co. of Canada, Ltd., has placed its new 6,600-bbl. per day U.O.P. Platforming unit on stream at the Montreal refinery. Like the company's first Platformer, a 3,300-bbl. per day unit at Vancouver, the new catalytic reformer was built by Procon (Canada), Ltd.

The steel strike delayed completion of United Refining Co.'s current construction program covering new fluid catalytic cracking and polymerization facilities. They will be placed on stream sometime in March. The construction job, contracted to Procon, Inc., includes a 4,000-bbl. per day cat cracker and a catalytic poly unit capable of producing 225 bbl. per day of finished polymer gasoline. Both processes are licensed by Universal Oil Products Co.

Skelly Oil Co. has purchased a field-processing plant at Medicine Lodge, Kans., to supply natural gasoline and butane to its 45,000-bbl. refinery at El Dorado. The plant is now producing 8,000 to 10,000 gal. daily. Skelly will expand product capacity this year to 40,000 gal. daily. The plant was purchased from Kansas Power & Light Co.

Wainwright Producers & Refiners, Ltd., has added new crude-distillation facilities at its Wainwright, Alta., refinery. The equipment will boost capacity 50 per cent to 4,500 bbl. daily.

Humble Oil & Refining Co. expects to have a new benzene unit on stream late this year at its Baytown, Tex., refinery. Badger Manufacturing Co. of Cambridge, Mass., started work on the 24,000,000-gal. per year unit 2 months ago. The unit will employ the Udex process and turn out 7,000 bbl. daily of aromatic-containing stream.

Canada's oil industry, with one ex-ception escaped any effects of the 9-day Canadian Pacific Railway strike which shut down operation of the line. The exception was Husky Oil & Refining Co., Ltd.'s, refinery at Fort Williams, Ont., which was forced to shut down the day before the strike ended January 10. Crude used at the refinery came by rail from southeastern Saskatchewan.

United Gas Pipe Line Co. has added propane-recovery facilities at its big Cabenza Creek natural-gasoline plant 8 miles southeast of Runge, Tex., in Karnes County, South Texas.

The plant now is producing 8,000 to 10,000 gal. of propane daily following completion of new reabsorber and depropanizer units plus auxiliary facilities. The new units also will increase plant production of butane.

Also for Refiners . . .

Derby Refining has completed a second expansion at its Wichita refinery, jumping the capacity 25 per cent to 20,000 bbl. (P. 69) . . . The increase in crude prices is expected to stick now that Canada, Venezuela, and California have joined the parade (P. 62) . . . Royalite Oil has a $50,000,000 program planned that is expected to result in development of Canada's Athabasca tar sands (P. 66) . . . The latest reports on the gas turbine, fuel injection, and atomic-power plants for autos were given at the S.A.E. meeting last week (P. 70) . . . Hydrocarbon Chemical of Newark has bought out a Texas producing firm in its search for raw materials (P. 71) . . . A tanker of Russian crude is keeping Tripoli refinery in business (P. 74) . . . B.P. will build a 60,000-bbl. refinery in the Ruhr (P. 74) . . . The 3,500-bbl. Syriam refinery in Burma will go on stream about March 1 (P. 77).

PLUS THESE TECHNICAL FEATURES: How loss of metal through corrosion is measured directly by new electrical-resistance method. It's fast and accurate (P. 85) . . . New design in process heaters offers more efficient utilization of radiant-firing of vertically suspended tube banks (P. 88) . . . and On the Job . . . In the Plants, a variety of tips to refiners (P. 116).

Gasoline offers nice, but . . .

Europe Insists on Crude

THE transatlantic feud between Britons and Texans over the oil shortage in Europe was getting down to specifics last week.

The verbal exchange was set off back in mid-December when the Texas Railroad Commission decided against a big increase in allowables.

The British press and political figures immediately took Texas producers to task for their lack of interest in helping get needed supplies of crude to Europe.

Replied the Texans: Buy our surplus products. It will cure the shortage and help us get our high product stocks down to a better level.

Last week the sometimes-bitter exchange had highlighted the principal points:

. . . **Gasoline stocks** in the U. S. are much higher than they should be.

. . . **U. S. oil men** would like to sell this gasoline and other light products to Europe to solve the shortage problem.

. . . **Europeans say** they have no gasoline problem. What's needed is residual fuel oil for industry and burning oils and diesel fuel for home heating and transportation. There is little residual to be found. Therefore, they need crude, not light products.

In Houston . . . Gen. Ernest O. Thompson, veteran member of the Texas Railroad Commission, said England is creating its own fuel shortage by refusing to buy U. S. gasoline.

"The present squabble over oil shortages in England could be ended promptly if England would buy gasoline. We have 185,000,000 bbl. of gasoline on hand," Thompson said.

Defending the Railroad Commission for its refusal to increase crude production to help meet Europe's temporary needs, Thompson said England could end gasoline rationing in 3 weeks by changing her imports policy.

"But no," he continued, "England says she wants crude oil and criticizes us for not sending her promptly all the crude she temporarily wants. We have already shipped her many millions of barrels of crude, but we get only criticism for not going all out at her bidding. England apparently still looks on us as a province or a dominion."

"Our stocks of products, gasoline, etc., are very excessive. I should think that England would understand that we must keep our stocks in balance against the day when she no longer needs our oil. The letdown would be paralyzing."

Thompson spoke at a meeting of the Gulf Coast section of the American Institute of Mining, Metallurgical, and Petroleum Engineers.

In London . . . The British minister of fuels replied to a cable to the Prime Minister from A. H. Herman, president of the Texas Independent Producers and Royalty Owners Association. Like Thompson, Herman had urged European nations to take gasoline from our extremely high stocks.

The British minister thanked Herman for his suggestion, but said his cable indicated that the "nature of the problem is not appreciated."

The ministry pointed out that Europe has little need for the gasoline. Fuel oil is "the gravest need," the ministry said. Therefore it is "vital to Europe to bring in the maximum amount of crude oil possible to be processed in our refineries producing heavy fuel oil."

In Paris . . . The 17 member nations of the Organization for European Economic Cooperation agreed to share the burden of the oil shortage by contributing to a special pool to meet individual emergencies.

The plan has the close cooperation of the international companies which supply Europe.

In effect, it asks these companies to take an equal percentage from the supply going to each O.E.E.C. member country and put it in an emergency pool. The pool would receive more than 1,400,000 bbl. of products every 10 days. Supplies in this pool then would be allocated to individual countries that find themselves in trouble.

The plan was outlined in Paris by Gerard Bauer, executive committee chairman of O.E.E.C.; John P. Berkin, of the Royal Dutch-Shell Group, who heads the O.E.E.C. petroleum-emergency group; and J. Angus Beckett, head of O.E.E.C.'s petroleum committee.

The plan is not meant to cure the shortage but to spread the burden "as fairly as possible."

The first pool will contain about 340,000 bbl. of gasoline, 362,000 bbl. of diesel oil, and about 732,600 bbl. of heavy fuel oil.

Supplies of residual were nearing the critical stage in Europe. The O.E.E.C. committee estimates that there will be only a 3-week supply available by the end of February, and this on a very restricted basis.

Berkin said the heavy-fuel shortage is hurting Europe most, that gasoline is no problem. He expressed hope that the Texas Railroad Commission would authorize an increase in crude production to make more heavy fuel available to O.E.E.C. countries.

The first allocation of emergency supplies was scheduled to be made late last week or early this week. The member nations most likely to find themselves in trouble are the Scandinavian countries and Mediterranean nations such as Italy and Greece.

The latter have no large stocks because they have always been so near eastern Mediterranean pipeline terminals they have had no need for extensive storage.

Refinery at Tripoli Saved From Closing By Russian Tanker

THE refinery at Tripoli, Lebanon, was within a day of closing due to dried up crude supplies when an emergency shipment arrived earlier this month.

More than 70,000 bbl. was unloaded from the Russian tanker, Ochakov. But the cargo was not Russian crude. It was Iraqi oil loaded at Banias, the first thaw in a 1,300,000 bbl. frozen supply which Syria had on hand after the disruption of the Iraq Petroleum Co., Ltd., pipeline system.

This supply of crude could keep I.P.C.'s 11,550-bbl. daily refinery operating for more than 3 months. Syria is taking half the product output, Lebanon, 41 per cent, and Jordan, 9 per cent.

B.P. Plans Ruhr Refinery

British Petroleum Co., Ltd., has become the third major company to schedule a new refinery in the Ruhr.

The company's West German subsidiary will build a 60,000-bbl. plant near Krefeldt or Cologne at a cost of $70,000,000. The refinery will include

special processing facilities. B.P. anticipates doubling its size at a later date.

The new refinery program, plus B.P.'s 33,000-bbl. Hamburg plant, which has a new 7,000-bbl. crude unit under construction, will bring the company's German capacity to 160,000 bbl. daily early in the next decade.

Aid For Yugoslavia

Dallas oil men sign up as consultants, U. S. approves

YUGOSLAVIA has asked for, and soon will get, technological help from American oil men on ways and means of hiking that country's production.

Two Dallas oil men will leave New York February 3 for Yugoslavia. They are George de Mohrenschildt, petroleum engineering and geological consultant, and George D. Mitchell, Jr., a consulting geophysicist. Yugoslav government representatives will meet them in Paris and escort them on to Belgrade.

The two Americans will inspect the country's nationalized oil industry for 8 to 10 months. They will advise the Yugoslavs on modern American methods of oil exploration and production, equipment needs, and wildcat prospects.

The project is a straight business deal, complete with contract, between the two consultants and the Yugoslav Government. It does, however, have the approval of the U. S. State Department.

The State Department, in fact, was instrumental in locating the technicians for the project. And the two Americans will stop over briefly in Washington, presumably for briefing by department officials.

The project is the first of this kind between this country and the Yugoslavs.

Lake Concession Cancelled

Venezuela has cancelled the Lake Maracaibo concession awarded to Venezuelan American Independent Oil Producers Association.

The Official Gazette of January 12 carried the nullification order signed by the minister of mines and hydrocarbons. The award involved is Block 10 in the lake. Reason for the official action was failure by Venezuelan American to pay bonuses within a month after the awards were ordered. Similar action was taken on the company's border concessions on November 20.

The nullification, however, does not affect the Northwest V-575 concession of 1,970 acres which Venezuelan American farmed out to Sun Oil Co. and Atlantic Refining Co.

Second Rig Will Probe Dhofar

ANOTHER rig is being assembled in Houston for shipment to Dhofar on the Arabian Peninsula. It will join in the exploration of a 32,000-sq. mile concession held by Cities Service Co. and Richfield Oil Co.

The new rig, which will be the second shipped to the Dhofar concession, is scheduled to go to work in March or April. The operators are now drilling their third well with the No. 1 rig.

The current operation—the Mazraq 1—was drilling below 3,500 ft. in mid-January, with no shows of oil or gas as yet. The proposed depth is 8,500 ft.

The first test—Dauka 1—was dry and abandoned at 11,700 ft. The second, Marmul 1, was abandoned as dry at 8,500 ft. It was drilled 80 miles to the east of the first test, creating a brief flurry of excitement last summer with reports it had found a "slight show" at about 1,900 ft.

Plans call for shipping the rig around the Cape of Good Hope because of the Suez Canal bottleneck.

The complete cargo, valued at about $1,500,000, also will include 30 carloads of mud, a year's supply of casing, four truck assemblies similar to those used in desert work by Arabian American Oil Co., 15 smaller trucks, 20 prefabricated houses, naval landing craft, and other equipment. Much of the cargo will be loaded in New York.

The rig, a Unit U36A, is being assembled by Joe Stine, Inc. It is driven by six Caterpillar D375s and is equipped with a 132-ft. Ideco Full-View mast.

Firms Earn More Abroad Than at Home

VALUE of foreign holdings to major oil companies is pointed up in recent figures on the source of the companies' earnings. Several firms bring in more money from abroad than they earn in the United States.

While the U. S. is the biggest market it is also the most competitive and the most expensive from the standpoint of costs.

These figures indicate that:

... **Standard Oil Co. (N. J.)** derives 26 per cent of its income from the United States; 50 per cent from other Western Hemisphere nations; 19 per cent from the Middle and Far East; and 5 per cent from Europe and North Africa.

... **Socony Mobil Oil Co., Inc.,** earns 47 per cent from this nation; 11 per cent from other Western Hemisphere; and 42 per cent from the Eastern Hemisphere.

... **Gulf Oil Corp.** derives 33 per cent from the United States; 20 per cent from other Western Hemisphere; and 47 per cent from the Eastern Hemisphere.

... **Standard Oil Co. of California** gains 61 per cent in the Western Hemisphere, and 39 per cent in the Eastern Hemisphere.

Middle East Optimism

● Texaco's Lilley thinks present gloom isn't justified. End of present crisis may begin an important new period

AMERICA'S bankers were told last week that the future of the Middle East's oil supplies and the entire area's prospects for future development aren't really so black if you "look beyond tomorrow's headlines" to the years ahead.

A. N. Lilley, vice president and director of The Texas Co., told the American Bankers Association in Chicago that he is optimistic about future stability in the Middle East in spite of the troubled conditions now.

Lilley, in charge of Texaco's foreign operations, made no attempt to minimize the seriousness of what's going on. But, he cites three reasons for his optimism:

...A stronger U. S. Government policy in the Middle East which he says shows a new awareness of the area's vital importance. He says this policy, aimed at safeguarding the rights and freedom of the Middle East's peoples, must have a stabilizing influence on the whole region.

...The Middle East must have western markets for its oil. The West needs the oil. This mutual dependence will work for stability.

"I have enough faith in human nature to believe two areas which are so vitally dependent, one on the other, will work to achieve solutions compatible with their mutual interests," Lilley said.

...The Middle East needs capital. The West is in a position to supply it. Lilley believes respect for contractual obligations will become more firmly established as nations in this area of the world see how vital continued large scale flow of western money is to their continued development.

The Texaco executive told his banker audience that the Middle East will become even more important to the free world's economy than it was before political troubles shut off a major part of the oil flow from that area to the West. He pointed to the fact that oil demand in Europe has been growing at the rate of 12 per cent a year, compared to 5 per cent in the U. S.

Five years ago, total free world demand was about 11,000,000 bbl. daily, one-third of it outside the U. S., he said. In another 5 years, Lilley predicts that demand will be 21,000,000 bbl. daily and fully half of it will be outside the U. S.

"Additional reserves will continue to be found in the U. S.," he conceded, "but in another 10 years, unless sizable new fields are discovered, about 3,000,000 bbl. of oil daily will have to be imported to meet U. S. needs. A substantial part of these imports will have to come from the Middle East."

Suez crisis . . . The Texaco vice president regards the disruption of Middle East oil supplies for western Europe as temporary. He took issue mildly with what he called "a great deal of gloomy talk" about U. S. oil interests in the Middle East since the Suez Canal seizure.

He pointed out that the Middle East has "at least" 145 billion barrels of oil reserves and American companies have access to more than half of this oil. He admits that the Suez Canal crisis will go on record as an important event in 1956-57, but warned that "we should not be blinded to the tremendous strides that have been made and are being made in rebuilding the economy of western Europe.

There is no reason to believe, Lilley said, that a continued optimistic view of Europe's economic future should be lowered once the oil supplies are restored.

"Certainly, if the Middle East is to reach its full share of economic growth in the world, it will be dependent in a large measure on the continued expansion of its principal market, Europe."

A. N. LILLEY
...Two areas that need each other.

Oil Monopoly Sought in Sicily

THE new Sicilian discovery claimed by the Italian Government's oil company may be used by Enrico Mattei in an effort to create a government monopoly in Sicily similar to the one his agency holds in the Po Valley of the Italian mainland.

AGIP Mineria, S.p.A., controlled by Ente Nazionale Idrocarburi, Mattei's government agency, is claiming a major discovery which it says will eclipse the Ragusa field in Sicily.

AGIP Mineria reported a promising show at the well several months ago *(The Oil and Gas Journal, September 17, page 135).*

Last week, reports from Italy were that AGIP is drilling three offset wells to its 1 Gela, near Piano del Signore, about 25 miles northwest of Ragusa field.

The government company apparently plans to exploit its discovery to the hilt in an effort to persuade the autonomous Sicilian Government to grant the company a monopoly in the area. Sicily, unlike the Italian mainland, has oil legislation that is regarded as encouraging to private oil companies.

AGIP has made no official reports on its discovery, but the company claims unofficially to have found a section almost 300 ft. thick between 10,600 and 11,000 ft. Reports from Italy indicate the section will produce more than 300 bbl. daily of 10°-gravity crude.

Ragusa . . . Until the AGIP discovery claim, the only commercial oil production in Sicily was Ragusa field, developed by Gulf Italia, a subsidiary of Gulf Oil Corp.

The Gulf company has been steadily developing Ragusa since its discovery in October 1953. The company now has drilled 18 wells in the field and estimates that its 1957 production will average about 21,000 bbl. daily.

A 35-mile pipeline linking Ragusa field with the 44,000-bbl. RASIOM refinery at Augusta is due to go into operation this month.

The Sicilian Gulf company several months ago claimed reserves of 147,000,000 bbl. at Ragusa, and the privately-discovered and operated oil field has done much to convince Sicilians of the wisdom of their 1950 oil legislation opening the island to private companies.

At that time, the Christian Democrat party fought off the determined assaults of the communists to pass the liberal oil legislation. It has come under repeated attack from the Italian mainland's socialist politicians.

Venezuela Looks Good

● But Creole's Haight warns that serious problems will come when the world's flow of oil returns to "normal"

CREOLE Petroleum Corp., Venezuela's largest single oil producer, had a banner year in 1956 and is looking forward to a 1957 just about as good.

H. W. Haight, president of the affiliate of Standard Oil Co. (N. J.), last week estimated that Venezuela's daily production will average 2,800,000 bbl. in 1957, or more than 12 per cent above estimates of 1956. Creole's share of that figure will rise to 1,200,000 bbl. daily, or just about 10 per cent more than the company produced in 1956.

Haight warned, however, that the Venezuelan oil industry will face some serious problems. He expects the Western European markets to return to "normal" supplies of Middle East crude during the last half of the year and believes this will call for reductions in Venezuelan output.

When this occurs, he says, the question of imports into the United States will once again become a serious problem.

"These problems should be acknowledged now so they may be handled in an orderly manner," Haight commented after Creole's directors' meeting in Caracas.

The Creole president says the normal market for Western Hemisphere oil is in the Western Hemisphere. He cites two basic reasons:

... **Foreign exchange.** Money to pay for Western Hemisphere oil is not available in European countries under normal conditions.

... **Middle East competition.** Western Hemisphere oil can't normally compete with Middle East oil in Europe because of costs.

Production . . . Haight estimates that Venezuela's daily average production in 1956 was 2,456,000 bbl., an increase of 13.8 per cent over the 2,157,900 bbl. daily produced in 1955. Creole's average in 1956 was 1,079,800, or 10.2 per cent over the 980,146 bbl. daily average in 1955.

Both Creole's gain and the entire Venezuelan oil industry's increase during 1956 were greater than the average increases for the past 10 years. During the 1946-56 period, Creole boosted its production an average of 7.1 per cent a year. Venezuela as a whole averaged an increase of 8.6 per cent a year for the same period.

Refining . . . Creole's refining operations showed even a more spectacular rise during the last year. The output of products by Amuay and Caripito refineries averaged 274,800 bbl. daily during the year. Compared to the 228,700 bbl. daily average in 1955, this shows an increase of 20.1 per cent.

Haight revealed, however, that the company's marketing position in Venezuela is still depressed by government regulations. He said local marketing meant a $15,600,000 loss to Creole in 1956. The rapidly expanding domestic market, along with the country's impressive economic growth, has eliminated the necessity for what he calls "subsidizing consumption" of petroleum products.

What's ahead . . . Just a few minutes before Haight reviewed his company's activities, Creole's board of directors approved a 1957 budget which calls for spending $169 million.

This is considerably below the actual $189,700,000 spent by Creole in 1956 when the budget was set up for $272 million. Haight explained, however, that $144 million previously approved for projects in the country will be added to the 1957 budget when materials are available. He also said additions to the budget will be made if the Venezuelan Government approves more Creole bids for additional concessions.

Haight cited the following Creole projects already approved, under construction, or planned. The list includes completion date and cost:

... **A second gas-conservation plant** in Lake Maracaibo, due for completion in 1957, at a cost of $30,900,000.

... **A third plant** in the lake, also for repressuring by gas injection, 1959, $29,600,000.

... **Gas collection system** in Bolivar Coastal fields, 1959, $13,200,000.

... **L.P.G. plant,** 1958, $11,200,000.

... **Terminal for supertankers** at Lake Maracaibo, 1957, $22,100,000.

... **Lagunillas pump station** and modernization of tank farm, 1957, $3,700,000.

... **A fourth crude unit** for Amuay refinery to go on stream this year, $7,200,000; a new 14,500-bbl. Hydrofiner, 1958, $3,000,000; and a lube plant, 1958, $6,300,000.

... **Deepening of port of Amuay** and enlargement of loading docks for supertankers, 1958, $8,600,000.

... **Four tankers of** 32,000 tons each, for delivery in 1959 and 1960 at a cost of $28,300,000.

... **An 87-mile, 30-in. pipeline** from Temblador field to Caripito, 1959, $7,800,000.

Quick Flow Possible

I.P.C. line can move third of capacity within a week

OIL can start moving through the damaged Syrian pipeline within a week after repairs are started.

Iraq Petroleum Co. said last week that it could send 220,000 bbl. daily of Kirkuk oil through its sabotaged line within 7 days after beginning repair work.

The company asked the Syrian government to permit its crews to start the work immediately. The line was shut down November 2 when three pumping stations were sabotaged at the outbreak of hostilities over the Suez Canal.

I.P.C. officials said a survey of the damage confirmed earlier estimates that the line itself still was usable. It can be operated at about one-third capacity by routing the flow around damaged stations and installing booster equipment.

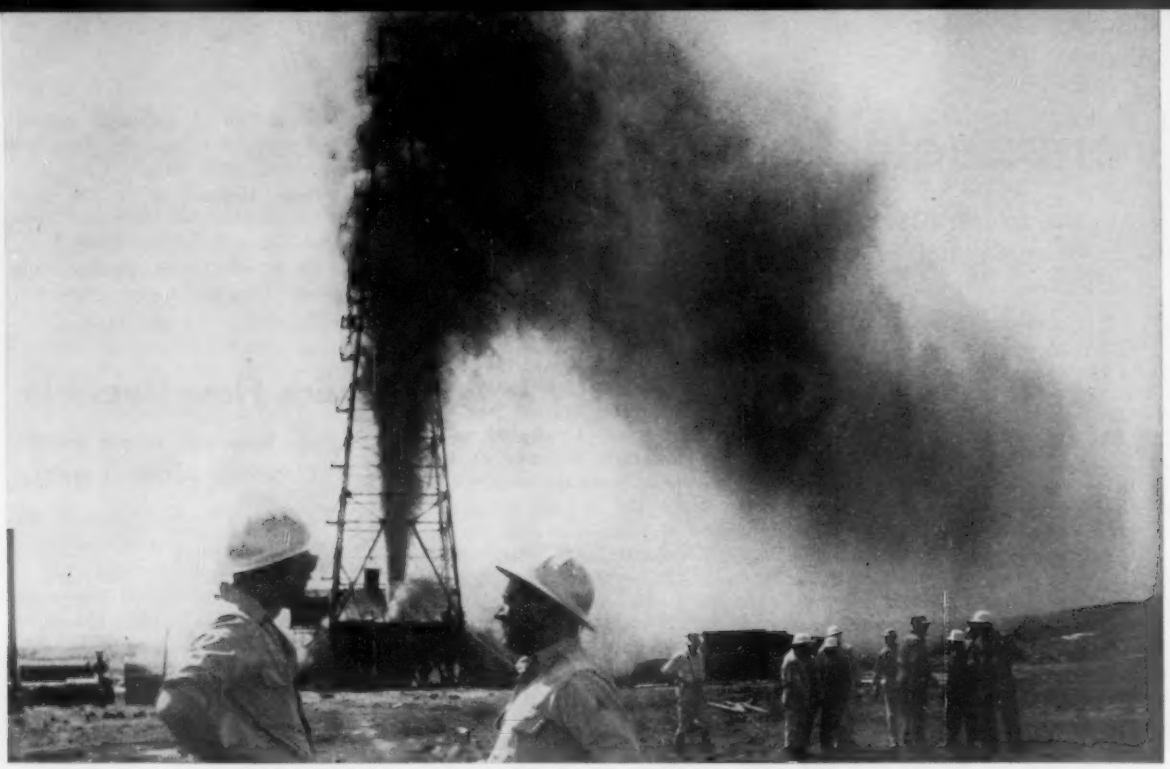
The 220,000 bbl. daily which could be started through the line quickly itself is about one-third of the present gap between European oil requirements and supplies.

Burma Refinery Almost Ready

The rebuilt Syriam refinery in Burma is expected to go on stream about March 1 with 3,500-bbl. daily capacity, only a fraction of its prewar throughput.

The refinery once processed Burma's daily production of about 21,000 bbl., but it was destroyed by the British in their retreat from Burma in World War II. It is being partially rebuilt by Foster Wheeler, Ltd., under contract with Burma Oil Co. (1954), one-third owned by the Burmese Government and the remainder held by Burmah Oil Co., Ltd.

Production from Chauk field has been moved down river to the refinery site near Rangoon for the past several months as crude stocks are being built for the plant to go on stream *(The Oil and Gas Journal, November 12, 1956, page 143).*



Coauthor Mostofi and F. Naficy inspect 5 Alborz, near Qum, in Iran, as it blew wild. Here's...

The Story Behind the 5 Alborz

... most spectacular discovery of 1956

by B. Mostofi and Dr. August Gansser

Managing director and chief geologist, respectively, of Iran Oil Co., Teheran, Iran.

THE wild well of Iran near Qum which blew out August 26, 1956, produced over 5 million barrels of oil before it bridged November 18, 1956. Located 330 km. from any established production, the well opened a vast new potential oil-producing region in North Central Iran.

Surface geology located the tremendous thrusted anticline on which the well was drilled. Five other exploratory wells failed to reach the pay horizon but pointed out the subsurface structure to lead to the location that finally tapped the reservoir. An extremely troublesome evaporite section continually menaced drilling and caused numerous sidetrack operations. When it was finally penetrated, tremendous pressure beneath blew out mud and control equipment and spewed oil over the countryside at the rate of over 80,000 bbl. per day for nearly 3 months.

Here is the story of this fabulous discovery.

The story of the exploration of the Qum area by Iran Oil Co. is one of successful efforts, unbelievable drilling difficulties, and some bad luck. It finally led to a success unexpected in its magnitude. And this success demanded an even greater stress on the company's organization than during previous years of its exploratory efforts.

The discovery well 5 Alborz is located in the complex Central Iranian basin approximately 115 km. south-southwest of Teheran, and 8 km. north of the holy town of Qum. The coordinates are Lat. 34° 42′ N. and Long. 50° 52′ E.

It is the first producing oil well drilled in Iran outside the Persian Gulf oil belt. It is in an entirely separate basin and opens a new region of oil resources which has so far not been included in the prolific oil areas of the Middle East. The nearest known oil field is Lali 330 km. to the southwest on the foothills of Zagros Range and Chikilshliar 430 km. to the northeast on the eastern shore of the Caspian (Fig. 1).

The gology of Central Iran and the Central Iranian basin in particular has been published recently in the proceedings of Fourth World Petroleum Congress (Gansser 1955), as well as the detailed stratigraphy of the Qum area with its Oligo-Miocene marine sections (Furrer and Soder 1955).

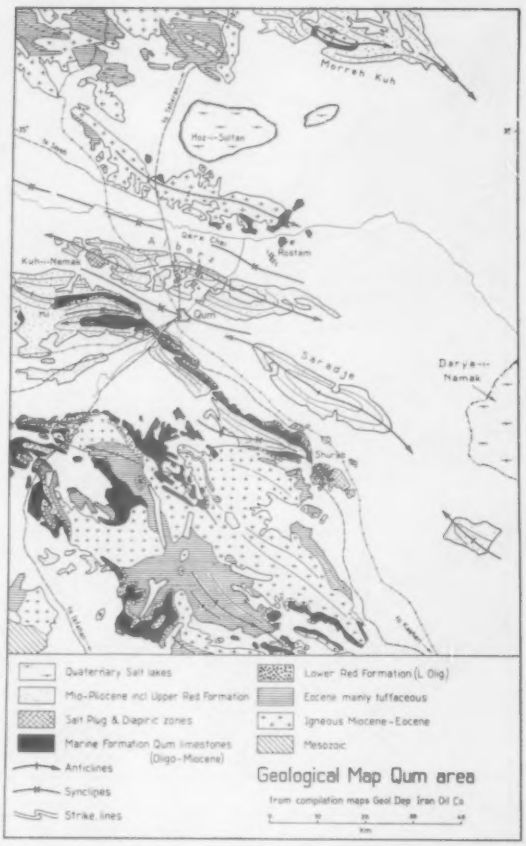
The following account deals therefore mainly with the development of the Qum area and its drilling activities. For the general geological information the reader is referred to the abovementioned publications.

Historical

In 1934 oil indications were found in the vicinity of the town of Qum when an underground channel dug for

EXPLORATION

NEW OIL PRODUCTION at Qum is 330 km. from nearest Persian Gulf oil field and 430 km. from Caspian Sea production. Location of oil structure was result of extensive geological surveys. Fig. 1.



TWO LARGE ANTICLINES exist near Qum, Alborz, and Saradje. Note the Alborz wells drilled are near the crest of the structure not far from a salt dome. Fig. 2.

the purpose of irrigation penetrated highly disturbed limestones belonging to the middle part of Oligo-Miocene. The oil seeped in sufficient quantity to invite the attention of local authorities. It had a specific gravity of 28° A.P.I. and a sulfur content of 0.65 per cent.

In the following year, the Iranian government's Department of Concession and Mines drilled two shallow holes near the well-known salt dome of Kuh-i-Namak 22 km. west-northwest of Qum. These holes were located on the western plunge of a small anticline east of the salt dome, and reached only a depth of 1,500 ft. Various small, somewhat doubtful oil and gas indications were reported and drilling was discontinued after a short time.

No other exploratory effort was undertaken in this area during the next 10 years with the exception of a mineral survey carried out by a Dutch company; some of the company's geologists mentioned Kuh-i-Namak anticline in their reports but strongly denied any oil possibility in this area or for the whole of Central Iran.

In 1947, after the withdrawal of the foreign troops from Iran, the Iranian Parliament rejected a proposal regarding an oil concession in areas bordering the northern frontiers; but Parliament enacted a resolution which instructed the government to set up an agency for exploration of oil resources of the country outside the area already under concession.

Pursuant to this charge, the government, after a comprehensive review of the situation, created Iran Oil Co. under the auspices of the Seven Year Plan. After the nationalization of the oil industry in 1951, the seven-year plan continued to finance the exploration work of Iran Oil Co. for another 4 years. In 1955 parliamentary legislation transferred the capital of this company to National Iranian Oil Co.

Iran Oil Co. thus became an exploration subsidiary of National Iranian Oil Co.

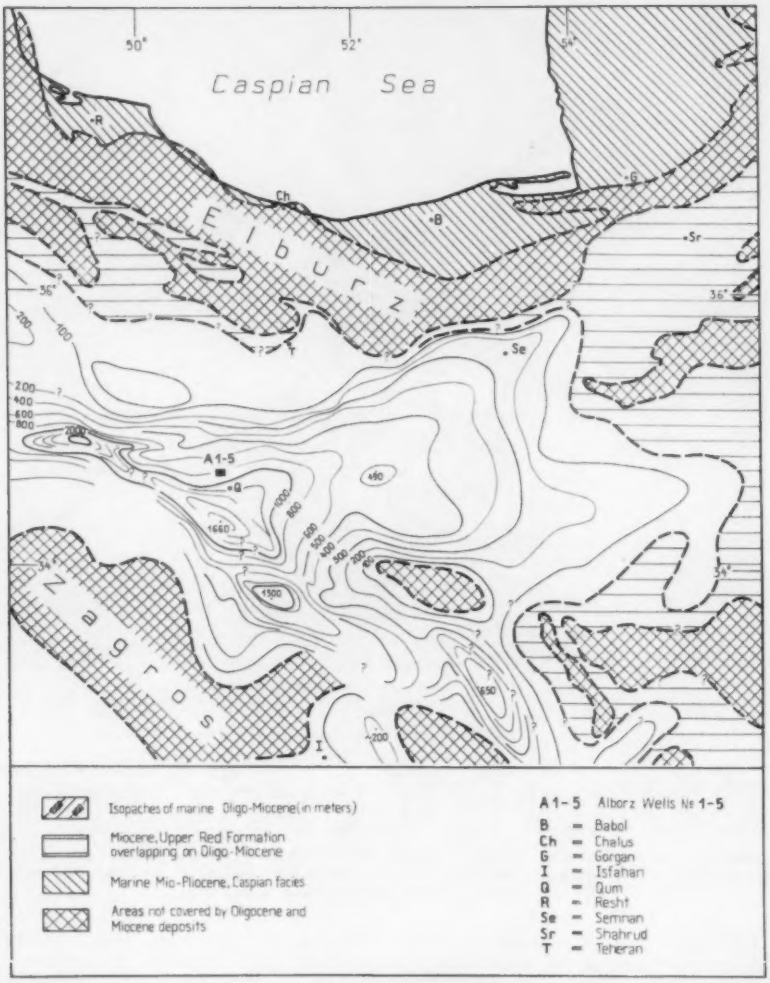
Exploration of Qum Region

Iran Oil Co. began its task early in 1949. It was clear from the start that a very extensive geological survey had to be undertaken in a total area of 500,000 sq. miles.

The geological department of Iran Oil Co. was, therefore, frist to be organized. And intensive work by several geological field parties began in early 1950 in areas of major oil interest and in particular the Caspian, Central Iran including Qum region, and Balutchestan. Extensive use of photogeology made it possible to accomplish a great deal in a short space of time. Already by late 1950 we were able to speak with some authority on the relative merits of different areas of oil interest.

Based on preliminary information, the two most favorable areas in the Central Iranian basin were the region north of the great salt desert and the Qum area. The latter was more readily accessible, and geographically very well placed; for these reasons it was decided to give priority to the Qum area where surface geological field work began on April 1950.

Large structures . . . During reconnaissance flights in May 1950, the full outlines of two large anticlines, observed already in the field, were recognized. The excellent morphological surface expressions of those structures called for an immediate photo coverage and subsequent photogeological



ISOPACH MAP of marine Oligo-Miocene formations near Qum shows the tremendous thickness of these productive limestones. Alborz 5 penetrated only 2 in. of the fractured limestone before it blew out. Fig. 3.

investigation. For this purpose the Iranian Air Force was requested to do the first part of the job. With most of our geologists working out the photogeology and field surveys in this region, maps in 1:20,000 scale were prepared of the area of interest in a very short time.

The two large structures were subsequently called Alborz (not to be confused with the Elburz Mountain Range) and Saradjeh (Fig. 2). The Alborz structure, including the previously mentioned local culmination near the Kuh-i-Namak (salt dome) is over 50 km. long and 12 km. wide from syncline to syncline. The surface structure is assymetric, overturned to the north on its eastern part, and to the south on its western extension. The principal surface culmination is on its eastern half. The Saradjeh structure is more symmetric, about 30 km. long and 8 km. wide. Both structures are open in the lower part of the Upper Red formation, which corresponds to the lower part of the Upper Fars in the oil-field belt of southwestern Iran (M-U Miocene).

When the first location for drilling was selected, the expected pay zone, the top of the Oligo-Miocene Asmari-type Qum limestones was believed to be about 6,000 ft. below the culmination of the Alborz structures. This information was gathered by preliminary investigations in the outcropping marine formations south of Qum.

Structural interpretations were based on a green marly marker beds, the "green band," which represents a thin marine intercalation in the brackish to terrestrial deposits, and which subsequently turned out to be a very constant horizon. The interpretation showed that the crest of the Alborz structure seemed eroded more deeply than the Saradjeh structure. This fact, and the easier accessibility of the Alborz structure were decisive for its selection as the site of the first test wells. The 1 Alborz was subsequently located 3,000 ft. south of the surface axis.

At the same time a new and most significant oil seep was discovered by our field parties in the Mil region, 25 km. west of Qum. This seep, known only to local shepherds, issues from gypsiferous rocks covering a very steep west plunge of a narrow Oligo-Miocene limestone structure. It was a new favorable indication for the Qum area.

First tests . . . Meanwhile two drilling rigs, originally purchased by Iran Oil Co. for drilling in the Caspian area, had arrived in Iran. Because drilling in the northern region had been postponed, it was decided to use one of the drilling rigs (a National 50) for testing the Alborz structure. A drilling contract had already been signed with Drilling & Exploration Co., of Los Angeles; under this agreement the contractor provided drillers and supervision for Iran Oil Co.'s drilling operation.

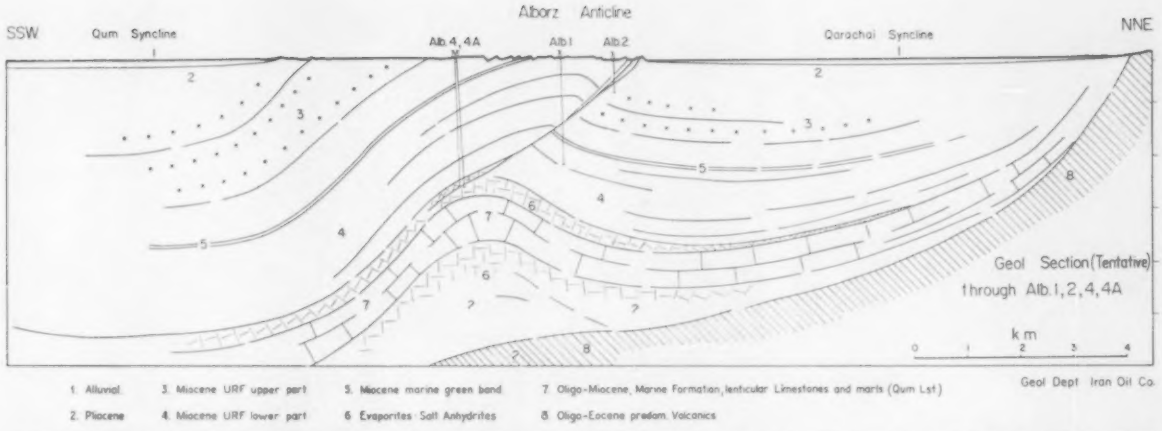
The 1 Alborz was spudded in on June 17, 1951, and reached 4,000 ft. without difficulties by the end of July. Below this depth, abnormal steep dips were observed in the few cores taken; and the green marine intercalation was found to be repeated. We thus realized that in addition to being asymmetric, the Alborz structure was evidently thrusted to the north. The actual thrust was not detected while drilling through it, since, apart from the green band, the Upper Red formation is most monotonous, consisting of hard reddish marly silts and reddish to gray silty calcareous sandstones.

Furthermore facilities for electrical logging were not at hand during our drilling operations. Based on the assumed thrust, repeating the formations, and the limit of our rig, the well was suspended at 6,600 ft. in September 1951. Only a surface casing was set in this well.

Geology complex . . . Oil indications were observed in gray sandstone at 5,070 ft. The well produced subsequently a small amount of oil, gas, and some salt water. When closed in, the wellhead pressure rose to about 200 psi. Most of the oil and gas must have originated from the thrust zone.

Next step was to verify the thrust. For this reason, a geological structure hole was located 1 km. north of 1 Alborz and about 2,000 ft. south of the assumed outcrop of the thrust zone. In addition, trenches were dug where the thrust zone was supposed to reach the surface.

The structure hole, called 2 Alborz, was drilling from September 21 to Oc-



CROSS-SECTION LOOKING WEST shows an eroded thrusted anticline. The first two holes served mainly to define the structure. Wells 3, 4, and 4A ran into trouble in the evaporites section, did not reach the productive limestone. Fig. 4.

tober 16, 1951, with a Franks 4000 rig. At 1,270 ft. the expected thrust zone was passed and oil-impregnated sandstones were cored. The fractured zone reached 1,700 ft. after which sandstones and marls of younger formations were cored. Having clearly established the thrust zone, the well was suspended at 2,060 ft. A subsequent drill-stem test in the impregnated sandstones was unsuccessful.

Meanwhile the detailed study of the trenches along the supposed outcrop of the thrust zone gave positive evidence of highly disturbed steep beds. This further confirmed the thrusted nature of this part of the Alborz structure.

With this information at hand 3 Alborz was located about 5 km. west of No. 1, already at the western plunge of the surface culmination. This location was practically in the middle of the large Alborz structure, where the asymmetry of the fold changed from north to south. It was felt that the surface culmination was not necessarly the expression of a structural high in the subsurface. Thrusting was believed to be less accentuated here.

This location was not unanimously accepted, however, future development proved this rather bold outstep to be surprisingly well placed.

Third test . . . Drilling of No. 3 began with a National 50 rig on November 25, 1951, and continued without difficulties to 7,000 ft. At 7,030 ft. rock salt, together with anhydrite and soft red marls, was cored. This salt occurrence was rather unexpected, since so far it had not been detected in the equivalent outcrops except in the salt domes, the origin of which was still rather obscure.

Salt, anhydrite, and highly plastic red saline marls caused considerable drilling difficulties. Drill pipe was stuck on several occasions and drill collars could not be fished and had to be sidetracked. It took nearly 4 months and numerous fishing operations to drill an additional 280 ft. and reach 7,310 ft. where 7-in. casing was set.

Drilling was resumed on June 23, in a formation consisting predominantly of rock salt. At 7,520 ft. salt water was flowing in the well in spite of a 92-lb. per cubic foot mud in the hole, indicating a bottom-hole pressure of about 5,000 psi. On July 2, 1951, at 7,627 ft., a sudden and substantial flow of clean oil and gas occurred. The main valve was closed and heavier mud prepared. Subsequent drilling proved that this oil resulted from a thrust within the evaporite section; this could be correlated with the main thrust observed in 1 Alborz well, however with a much reduced throw.

Oil shows most encouraging . . . During the middle of July the oil flow was tested with a formation tester, but after a strong initial blow, no substantial production was obtained. The highly paraffinic oil could have been frozen by the sudden pressure relief. Effort to produce through a liner was equally barren of result.

Drilling was resumed in February 1953, after considerable difficulty in sidetracking part of the liner that could not be retrieved. For some unknown reason the liner was bent. Drilling was most difficult in sticky saline marls, and the drilling unit was at the limit of its capacity. We still hoped to reach the marine formation, but when the pipe stuck at 7,780 ft., all efforts to free it was of no avail. Part of the pipe was left in the hole and the well was temporarily abandoned.

In June 1953 the well made 15 bbl. of gas and oil. It was subsequently closed and a pressure gage installed. By the end of 1953 the wellhead pressure reached 1,500 psi. In March 1954, during a production test, 25 gal. of light gas-cut oil was produced through a 11/64-in. bean in 5 minutes. The pressure and oil flow subsequently dropped rapidly.

In September 1954 the pressure rose to 1,900 psi. on the wellhead. All these informations clearly indicated that a lively oil source must exist, but that conditions in this well prevented us from producing it properly.

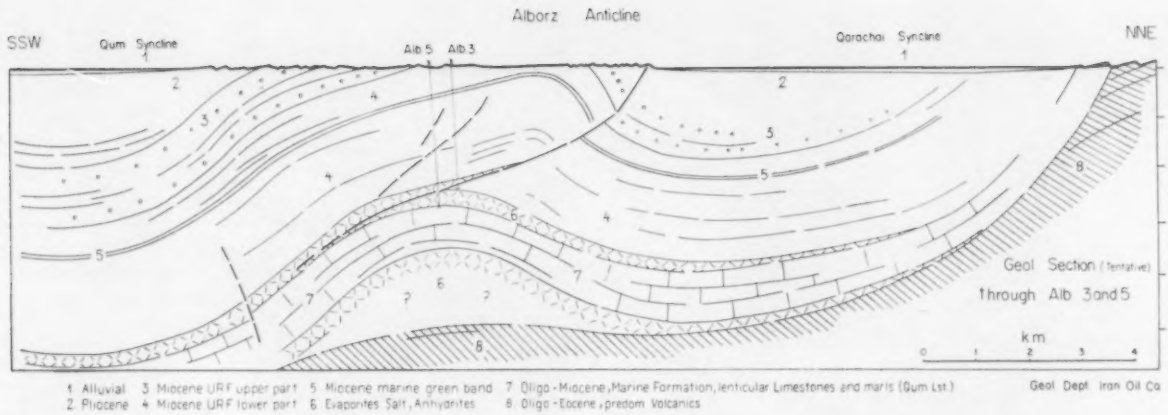
The oil was highly paraffinic. A weathered sample showed the following properties:

Sp. gravity, °A.P.I.	34
Pour point, °F.	69
Sulfur, per cent	0.13
Water and sediments, per cent.	0.2
Initial boiling point, °C.	94

This first and very important oil show in Central Iran was highly publicized in this country, which had nationalized its oil industries only 2 months earlier. It was, however, surprisingly ignored outside Iran. The spectaculer blowout of 5 Alborz came therefore as a very great surprise to many, ignorant of the previous efforts of 6 years of exploration.

Looking back, it appears now that by drilling only 1,000 ft. deeper we would most probably have hit the prolific level of 5 Alborz. Without our great drilling difficulties, the present spectacular results of 5 Albroz could have been obtained 4 years earlier.

Deep structure masked . . . One of the most interesting results of 3 Alborz was the fact that a plastics salt formation formed a cap rock over 600 ft. thick above the marine formation. The thrust from which the oil flow was issuing was very flat, and most likely must have originated from the evaporite section and not from underlying limestones. It seemed now obvious that in this part of the basin


Alborz Anticline
SSW
Qum Syncline
Alb 5
Alb 3
Qarachai Syncline
NNE
Geol Section (Tentative)
through Alb 3and5
km
0 1 2 3 4
1 Alluvial 3 Miocene URF upper part 5 Miocene marine green band 7 Oligo-Miocene,Marine Formation,lenticular Limestones and marls (Qum Lst.)
2 Pliocene 4 Miocene URF lower part 6 Evaporites Salt, Anhydrites 8 Oligo -Eocene, predom Volcanics
Geol Dept Iran Oil Co

WELLS 3 and 5, drilled about 5 km. west of wells 1, 2, and 4. (Fig. 4) confirmed the extent of the large structure. Well 5 consumed 6 months in penetrating the evaporite section. When it tapped the limestone, pressure blew 17.2 lb. per gallon mud from the hole. Fig. 5.

where the salt formation was well developed, the deeper structures were folded disharmonically, below the surface structures. This fact, long known from the southern oil fields, was not evident in the marginal and outcropping open structures of the Qum basin.

Assuming disharmonic tectonics, the folding of the Oligo-Miocene limestone structure was supposed to be less steep than previously expected. It would thus justify an investigation by a reflection seismic survey which in steeper, conformable formations would have been less favorable.

Under the existing foreign-currency restrictions, only preliminary seismic trials with rather obsolete equipment were carried out in the Alborz area. These first trials were not successful. We only began a competent seismic investigation of the whole area through a contract with United Geophysical Corp. in the summer of 1955.

In order to gain additional information on the nature of the Qum limestone, two geological core holes were drilled with a Franks rig, 16 km. northeast of 1 Alborz location; three lay on the north side of the Qarachai syncline which joins the Alborz structure to the north (Fig. 2). More than 2,700 ft. of limestone was continuously cored.

This newly obtained limestone section gave up additional information on the development of the marine Oligo-Miocene formations in the Central basin. The presumed thickness (in meters) of these marine deposits are compiled in Fig. 3.

Since our prospect could not safely be reached with a National 50 drilling rig, a heavier rig (a National 100) was acquired and installed at a new location, 4 Alborz. This location, originally planned to be a replacement well for No. 3, was subsequently placed 2 km. south of 1 Alborz, south of the surface crest of the structure, and 5 km. east-southeast of No. 3.

In spite of the larger drilling rig and improved mud treatment, 4 Alborz, which was spudded in on April 19, 1953, passed through every drilling difficulty and misfortune imaginable. The evaporite section was reached at 7,620 ft., nearly 700 ft. lower than in 3 Alborz. Soon drilling difficulties began. And on November 15, 1953, the pipe got stuck at 8,380 ft., could not be freed, and had to be parted by shooting.

After recovering the greater part of the drill pipe, operations were begun to sidetrack the remaining fish. The difficulties caused by the formation and the often unbelievable hard luck are best reflected in the fact that these operations took 8 months, with the best available experts at hand. In July 1954, the hole had to be abandoned and a decision was reached to redrill the same location, skidding the derrick 25 ft.

This new well, 4A Alborz, was spudded in on August 7, 1954. After nearly touching the old hole, the well drifted safely updip, and topped the salt formation about 200 ft. higher than in No. 4. Early in December 1954 the well reached a depth of 8,460 ft., drilling through a complex salt marl formation. Here the drill pipe got stuck again and subsequently parted. During fishing operations the washover pipe got stuck too, and after 2 months of unsuccessful trials to recover the two fishes, this well also had to be abandoned.

Preparations were then made to drill a replacement well for 3 Alborz. The drilling material was moved to the new location No. 5, situated only 1,500 ft. to the south of No. 3.

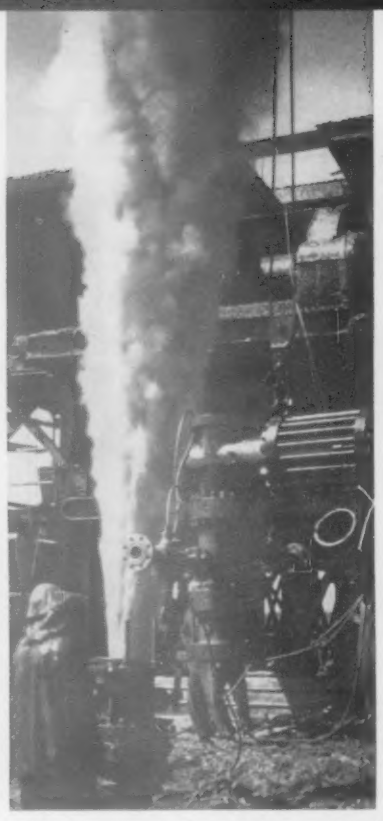
Seismic confirmation . . . For various reasons, drilling operations began only on January 5, 1956. Meanwhile our reflection seismic operations in the Qum region had outlined the subsurface of the Alborz structure to such an extent that a check on our location for No. 5 was possible. The preliminary seismic results fully confirmed our choice based on regional deductions and geological surface informations. The proposed location did not have to be changed. The seismic results were still handicapped by a lack of proper velocity control. Unfortunately the previously drilled wells were not in conditions to allow a successful well-velocity survey. The 5 Alborz was thus a selection based on geological information only.

During all this time, a considerable amount of field work has been carried out in Central Iran, particularly in connection with the Oligo-Miocene marine formations. In spite of some faunistic similarities, the lithological aspect of Qum limestones differs considerably from the Asmari limestones in the southern oil fields. The lenticularity of the outcropping Oligo-Miocene Qum limestones, its rapid facies changes as well as its rather low porosity and strongly irregular permeability have made any prediction of its producing and reservoir qualities most difficult. Our geophysical information was no help in this connection. Considering the substantial oil shows and high pressures observed in No. 3, however, the new location looked favorable.

Drilling the discovery . . . Based on our previous experience, it was decided to case the well with a 9⅝-in. casing once the evaporite section was reached. A second string (7-in.) was proposed to be set after passing through the evaporite, i.e., on the top of marine formations.

Without any major difficulty, the well reached the top of the evaporite section at 7,533 ft., only 30 ft. above predicted depth. This showed that no major disturbance existed between wells 3 and 5. On March 20, 1956,

BLOWING WILD for nearly 3 months the well created rivers and lakes of oil shown here. Hastily built dams managed to trap about 1½ million barrels of the 5 million barrels estimated produced.



CONTROL FITTINGS choked wellhead pressure to 2,500 psi., couldn't hold well. It finally bridged itself.

the 9⅝-in. casing was successfully cemented.

Drilling continued in the evaporite section. Just as before, this was a complex mixture of rock salt, some anhydrite, and plastic reddish clays, and again caused considerable drilling trouble. At 100 ft. below the casing shoe the pipe got stuck and could not be freed. After washover operations the fish was recovered. But only a day later the bit stuck again, while being pulled out. During subsequent fishing operations even the washover pipe got stuck. After a 1½-month effort to recover the fish without success, it was eventually sidetracked. Drilling continued to a depth of 8,120 ft. when the pipe stuck again and was only partly recovered. Fishing operations continued until middle of August without success.

The situation looked rather hopeless, when the fish was finally sidetracked and drilling continued without major interruptions. At 8,500 ft. a flood of well-preserved globigerinas was observed in the ditch samples. However, the delicate drilling situation did not allow us any core for checking this faunal break. Drilling had to be continued as quickly as possible to the top marine beds where a 7-in. casing was to be set. The observed faunas indicated marine intercalations within the evaporite zone. This globigerina horizon had not yet been met in our previous wells, and we expected the marine horizon to appear at any moment.

The drilling fluid, a supersaturated salt-base drilling mud, was carried with a density of 135 lb. per cubic foot. Because the pressure encountered in well No. 3 was about 5,000 psi., it was feared that, if fractured limestone were reached, this excessive hydrostatic head would cause loss of circulation. Below 8,500 ft. the mud weight was therefore somewhat reduced to a specific density of 129 lb. per cubic foot. and drilling continued. The deeper section consisted predominantly of rock salt.

Early in the morning of August 26 a slight formation change was noted. Judging from the ditch samples, a chalky, somewhat plastic anhydrite was drilled through. After drilling about 2 ft. in this formation, hard rock was hit. The behavior of the bit indicated fractured limestone. The intention was to drill about 1 ft. into this hard layer, then take a core and set casing.

The blowout . . . At 3:30 a.m. of August 26, 1956, within a few minutes after the formation break and only after having drilled 2 in. into this hard rock, the well blew out. Instead of losing mud into the formation as it was originally feared, the mud colmn was blown out of the hole, followed by oil and gas. The blowout preventer was closed immediately, but the pressure was such that the packers were torn out and the preventer did not hold. After closing engines and pumps and putting out rig lights, the drilling crew had to leave the rig, and the well was blowing widely in the total darkness.

At the break of dawn it was abundantly clear to all onlookers that this was no ordinary blowout. Oil and gas blew 100 ft. over the crown of the derrick spraying the countryside for many miles in the direction of a strong but shifting wind.

The well is located at a point less than 200 ft. from the busiest highway in Iran and less than 3 miles from Trans-Iranian Railways and its steam locomotives. Immediate action had to be taken to reduce the fire hazard as much as possible. The road and railway line were closed. Motor traffic was diverted to a hastily improvised bypass road. Dams were put up across the natural drainage through which a fair-size river of oil was flowing and threatening to flood the new bypass road and the plains beyond. By the middle of the first day a lake of oil of considerable size was beginning to form in the valley nearby.

State of emergency . . . The government, at the request of the company, declared a state of emergency in the area around the well and several units

of the Iranian army were quickly brought in to control the traffic and impose very strict fire-prevention measures over an area of many square miles.

Everything had to be planned for the imminent possibility of the well catching fire. The fact that it did not was due to the energetic steps taken in the first day of the blowout and the good fortune of having a very strong wind blowing in the right direction. Providence looked after those who worked around that well.

Help was offered by the army, civil authorities, contractors, the operating companies of the International Oil Consortium, and later by other companies operating in the Middle East and gratefully accepted. Men and material moved in the area soon and a great deal of work was accomplished in a very short time. Our modest wildcat camp at Alborz normally catered to about 120 people. By the third day of the blowout, the camp had 1,200 people, not counting 700 soldiers of the army who had cordoned off the dangerous areas.

Heavy machinery and special equipment were busy by dozens to help experienced crews install miles of oil and water lines, digging very large earthen reservoirs, putting up dams, and making new roads.

Meanwhile 5 Alborz, in majestic defiance to man's fight against nature, was blowing as wildly as ever. A gage installed on the eastern oil river flowing in No. 1 dam showed average flow of 80,000 bbl. a day. This figure, of course, did not include a large quantity of oil spread by the wind in other directions and partly collected on the western drainage. The estimated initial production of 80,000 bbl. a day must therefore be regarded as conservative.

Controlling gusher . . . Myron Kinley, the well-known fire and blowout expert, arrived from Texas and took over the fighting of the wild well. It was the biggest blowout he had met in his 35-year career. Special equipment had to be flown in from southern oil fields and the United States. After cutting the drill pipe and pulling down the derrick, the removal of substructure and other wellhead fittings proved to be a very difficult task. But eventually the well was capped on September 13.

It was, however, impossible to close the well in, since the wellhead pressure was considerably more than estimated and far above what could be allowed on a badly battered 9⅝-in. (N 80) casing. When closing in, the pressure rose to over 4,500 psi. with a 1-in. line fully open and a 2-in. line only partly closed. The oil was therefore allowed to flow through a 4-in. side outlet with a wellhead pressure of about 1,800 psi.

The considerable amount of gas produced, of which no reliable estimates were possible, endangered the neighboring town and villages. A special group of metereologists and chemists were busy studying wind directions and air-gas mixture, on which traffic on roads and rails depended. When it was realized that the flow could not be closed down for the time being, safety measures forced the company to put the oil and gas to the flare. Two special double flow lines, one to the east and the other to the west, were installed and the oil and gas were flared. The gigantic fire was a new landmark in the wider surroundings. This was done on September 16, 3 weeks after the blowout.

Abrasion danger . . . A new difficulty was now confronting us. The high rate of oil flow with its enormous pressure and velocity was bringing up a great quantity of sediment of large and small size from the uncased lower part of the well. This caused a great deal of abrasion continuously taking place in the wellhead fittings and in the casing, especially opposite the numerous tool joints of the drill pipe which was still in the hole.

It was clear that with this continuous abrasion, the casing or the wellhead fittings would sooner or later wear out. It was therefore decided to select the site for a deviation hole in order to reach the bottom of 5 Alborz and kill the well as soon as possible. Special equipment were ordered from the United States and the preparation for drilling the relief well began.

Meanwhile the wellhead fittings were not standing up to the enormous rate of abrasion. Special valves and fittings had to be flown in from the United States and installed on the wellhead. Some of these failed almost as soon as they were installed. In fact no valve manufacturer would guarantee performance under such a high pressure, temperature (240° F.) and rate of flow. By trial and error, a combination of different valves and fittings were eventually found to work satisfactorily. A constant vigil had to be kept by experienced crews in order to spot leaky valves or bends and change the flow line when necessary.

When the new wellhead fittings were installed and oil and gas were safely flared at a safe distance, it was decided to choke the well gradually with a view to decreasing the rate of flow and hence the rate of abrasion. It was observed that when a pressure of about 2,500 psi. was maintained on the wellhead, the amount of sediments coming up was greatly reduced.

Any drop on the wellhead pressure, however, was instantaneously accompanied with a sudden rush of sediment up through the wellhead. This occurred mostly when the flow lines were being changed and when the two lines were both open for a brief moment. On one of these occasions on November 16, 1956, while changing chokes, a great caving took place and the well bridged itself, probably in the annular space between the casing and the drill pipe. The wellhead pressure dropped from 2,500 psi. to 200 psi. within minutes and to zero in less than an hour.

The well remained quiet for 39 hours but was active again for 5 more hours when it bridged itself again. The well then was lubricated with a column of mud and remains dormant at the time of writing.

The well had produced more than 5 million barrels of oil. Of this, about 1½ million barrels had been collected in the three lakes and was gradually pumped into the six round reservoirs built in the plain, where the oil was safe from eventual rain flushing.

National Iranian Oil Co. was busy finding a local market for this oil. Fleets of tankers are now hauling the oil to various factories in towns, and much road improvement was done through the spreading of crude oil.

Samples from the crude oil were collected and analyzed. The highly paraffinic oil collected at atmospheric pressure had the following properties:

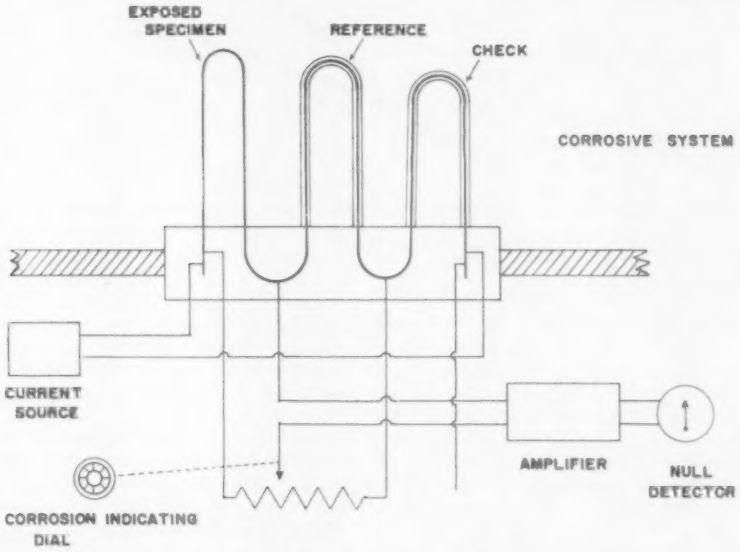
Sp. gr., °A.P.I.	39
R.v.p. at 100° F., lb.	5.8
Pour point, of	70
Distillation, i.b.p.	52 °C.
Volume distillate, per cent—	
100 °C.	8
150 °C.	18
200 °C.	28.5
300 °C	49
Residue, per cent	49.5
Total sulfur, per cent	0.85
Hard asphalt, per cent	0.08
H_2S	nil
Wax, per cent	10.8
Salt, lb. per 1,000 bbl.	12.3

Reserves large . . . The accumulation of oil in the Alborz structures must be considerable. Any estimate, however of the size of the future field must await further tests by drilling.

The fact that the produced oil must have been generated within the marine formations corresponding to the Asmari limestones and marls in the southern oil fields is of great importance. The consensus is that most of the oil migrated from older, predominantly Mesozoic formations into the Tertiary reservoirs. Based on our studies, related in our paper on Central Iran, the fact seems evident that no oil could have migrated into the Qum limestone from older formations, since 2,000-3,000-m.-thick deposits of volcanic Eocene, including evaporite deposits, underlie the Qum basin.

A PORTABLE DIRECT-CURRENT instrument is finding increased use for corrosion studies in refineries and oil fields. At right progress of corrosion in the accumulator has been followed by means of the probe installed near the bottom. Fig. 1.

Corrosion Rates Directly Measured



SCHEMATIC DIAGRAM of the electrical circuit used in the new corrosion measuring method. Fig. 2.

By New Resistance Method

by D. H. Stormont
District Editor

THE petroleum industry has a new tool for determining corrosion rates. It is an electrical-resistance method which directly measures loss of metal from a probe installed in the corrosive system under study.

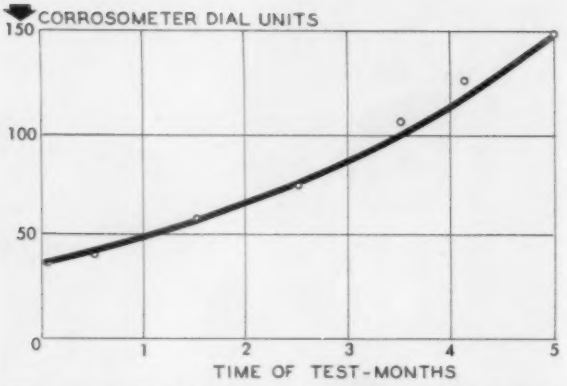
Field and plant tests carried out during recent months show it can be used to determine corrosion rates quickly and accurately. It has proved a quick, sure method for evaluating the effectiveness of chemical inhibitors in oilfield installations, pipelines, refineries, and natural-gasoline plants.

The "Corrosometer" (developed by Crest Instrument Co., Santa Fe Springs, Calif.), is basically a resistance measuring system. It electrically follows the progress of corrosion on the probe by means of a special meter. The instrument responds to the resistance of the exposed metal specimen as a whole. Any change is indicated as if the loss had occurred uniformly over the entire surface of the specimen. Due to this averaging effect the data obtained are like the averages resulting from weight-loss measurements.

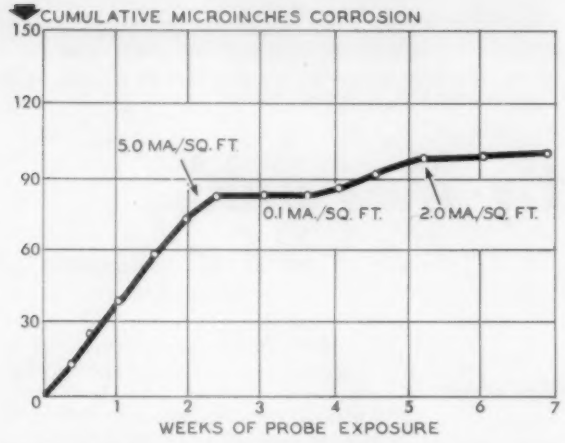
Measurements are made without removing the probe from the corroding environment. Accumulations of corrosion products, scale, or sludge do not affect the measurements. Readings are essentially independent of the temperature and nature of the corrosive medium. The metal specimen in the probe is made of whatever metal is of interest.

. . . Operation of the meter is based on the fact that the electrical resistance of a piece of metal increases as corrosion removes metal from the surface of the specimen. The meter circuit uses this change of resistance to indicate the extent to which the metal is converted into nonmetal.

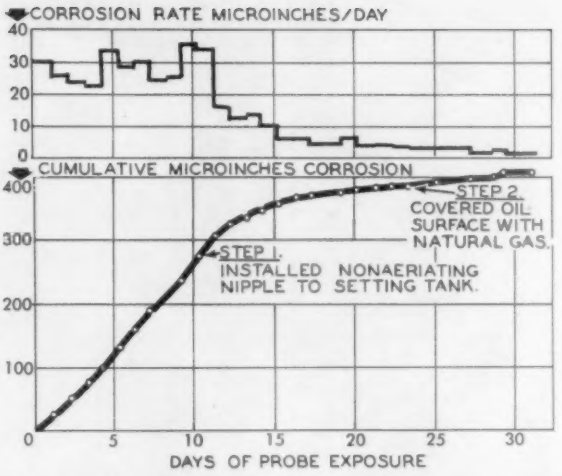
Resistance of the exposed specimen



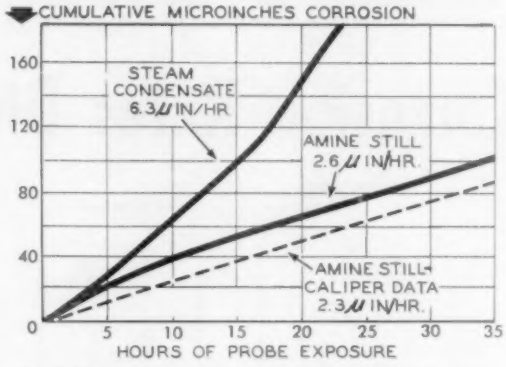
THIS CORROSION-RATE STUDY was carried out in a California well for 5 months. It showed corrosion was proceeding at a 2.7 mils per year rate. Fig. 3.



EFFECT OF CATHODIC CURRENT on corrosion of a water storage tank. Fig. 5.



THIS 30-DAY STUDY of corrosive conditions in a Huntington Beach power oil system enabled the operator to reduce the rate from about 30 microinch per day to a very negligible value. Fig. 4.



CORROSION RATE of a mild-steel probe installed successively in various parts of an amine treating unit at a natural-gasoline plant. Fig. 6.

is not measured directly by the meter circuit, however. As shown in Fig. 2 a second specimen—made from the same metal or alloy—is placed in the probe and connected in series to the first. Both are made part of a bridge circuit.

As the reference specimen is covered with a corrosion resistant coating it retains its original cross-section and resistance. Changes in the ratio of the two resistances, due to changes in the resistance of the exposed element, are translated directly into units of corrosion by the meter circuit.

The third loop shown in the diagram is used for checking the resistance of the reference specimen. In field tests it is desirable to know that the coating on the reference specimen is in good condition; that any change in meter reading is due only to corrosion of the exposed specimen. The reading is accomplished by connecting the reference and check specimens in the bridge circuit and measuring their resistance ratio.

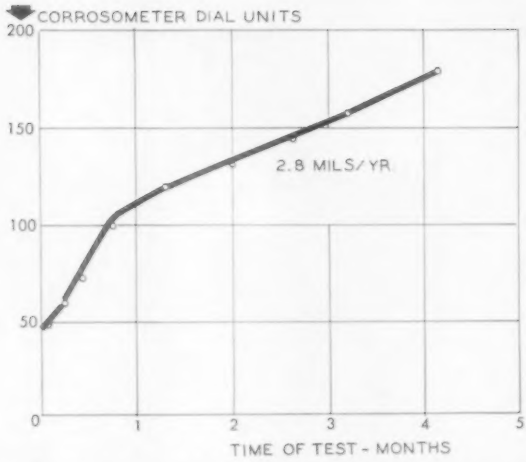
Operation of the bridge readings by the potentiometric null method was found to be superior to a direct reading method in which a given current or voltage is set across the probe and displacement is recorded from an initial null. Because of its several advantages, one of which is that long leads can be used without special calibration, the null method was made the primary basis for the three different meters which have been developed.

Direct current is necessary for a completely portable model, but either direct or alternating current may be used to operate the bridge circuit of the laboratory and recording-type meters. All meters are designed to follow the corrosion progress of the exposed specimen until it has been reduced to one-half of its original thickness. It has been found, however, that useful information is not always obtainable over this entire range.

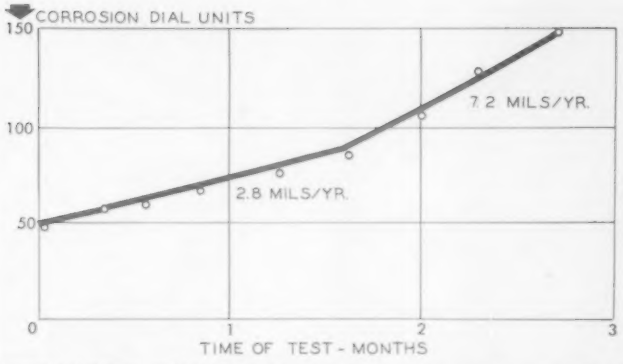
The portable d.c. meter has proved to be the most valuable because it is suitable for use in the field, plant, or laboratory. Its insensitivity to a.c. pickup allows interference-free operation near pipelines and other underground structures. Resolution of the order of 0.5 microinch can be made on a strip specimen 4 mils thick.

... Probes used are constructed in many different ways, depending upon conditions of the system under study and purpose of the study. Wire specimens provide the longest life for a given cross-sectional area of the element. They are particularly suited for long-range testing and collection of control data. Strip specimens, which give maximum response to corrosion, are useful for short-range tests and laboratory studies. Tubing offers fairly rapid response combined with ruggedness.

Adaptations of these basic forms include insert units that terminate in a special metal fitting which also serves as a pressure seal. Variations include a flat grid pattern between two plastic housings. This probe was designed for use along pipelines and other buried or submerged systems where maximum



THIS PROBE STUDY of corrosion rates in the wet gas flow line of a California natural-gasoline plant indicated a rate of 2.8 mils per year. Fig. 7.



THE MARKED CHANGE in this study of corrosion rates in an overhead accumulator at a Los Angeles refinery was due to a change in stream materials. Fig. 8.

access to the corrosive environment is needed.

Field tests . . . The new corrosive study tool is being used in a variety of ways in California fields. In some cases probes have been left in lines or vessels for many months so that progress of corrosion or effectiveness of a corrosion-mitigation program can be followed continuously by frequent control readings (Fig. 1).

Fig. 3 shows the results of a study carried out at one California well over a 5-month period. A mild-steel probe was installed in the 3-in. flow line. The well was flowing 100 bbl. of fluid daily at 300 psi. The 15 per cent water cut contained 25,000 p.p.m. of solids. The study indicated a corrosion rate of 2.7 mils per year.

A Huntington Beach test particularly illustrates how the method can be used to pinpoint the cause of excessive corrosion. At a hydraulic free-pump installation there, corrosion was so severe the free pump had to be replaced every 60 to 90 days. Installation of a probe on the suction side of the triplex pump showed a corrosion rate in the order of 30 microinch per day (see Fig. 4).

Suspecting that oxygen picked up at the spreader in the storage tank was the cause of the high corrosion rate, the operator took remedial steps. The first one involved installation of a nonaerating nipple in place of the spreader. This step greatly reduced the pickup of air and materially reduced the corrosion rate on the probe—to approximately 5 microinch daily.

A second step was to provide complete exclusion of air through maintaining a gas blanket in the settling tank. This resulted in the corrosion rate being reduced to a negligible value.

Fig. 4 shows the cumulative corrosion readings taken during the 30-day test, and the corrosion rate calculated on the basis of successive readings. As might be expected, individual differences between each successive pair of readings vary widely. By plotting the individual readings against time, however, a more representative value was calculated from the slope of the curve.

How the method was used in evaluating the effectiveness of cathodic protection on a small water storage tank is shown in Fig. 5. A grid probe was installed close to the inside wall. The probe leads were grounded to the tank throughout the 7-week test except for the short periods required for meter readings.

During the first 2 weeks a corrosion rate of about 5 microinch per day was established for the unprotected tank Cathodic protection then was applied to the tank from a single durion anode located at the tank center.

Results of successive applications of 5, 0.1, and 2 ma. per sq. ft. were as shown. Changes in the slope of the curve indicated the current density required to protect the tank is between 0.1 and 2 ma. per sq. ft.

Fig. 6 shows the results of a study carried out in the monoethanolamine H_2S stripping unit at a North Dakota natural-gasoline plant. The gas contained 1.5 per cent H_2S and 2 per cent CO_2. The amine still was operated at 245° F. and a pressure of 10 psig.

A probe was successively installed in the lean-oil line, in the still, and in the condensate line. As might be expected, no corrosion was found in the lean-oil line. A high corrosion rate was found in the condensate line, where acid components would be found.

The corrosion rate found for the amine still by the Corrosometer method compares very well with that calculated from the micrometer and caliper survey made earlier on this same system. The capiler survey, made after 18 months' operation, gave a corrosion of 2.3 microinch per hour. Probe study required only 35 hours and gave a corrosion rate of 2.6 microinch per hour.

Fig. 7 shows the data collected by a probe installed in the wet-gas flow line at a California natural-gasoline plant. From the slope of the upper portion of the curve a corrosion rate of 2.8 mils per year was calculated.

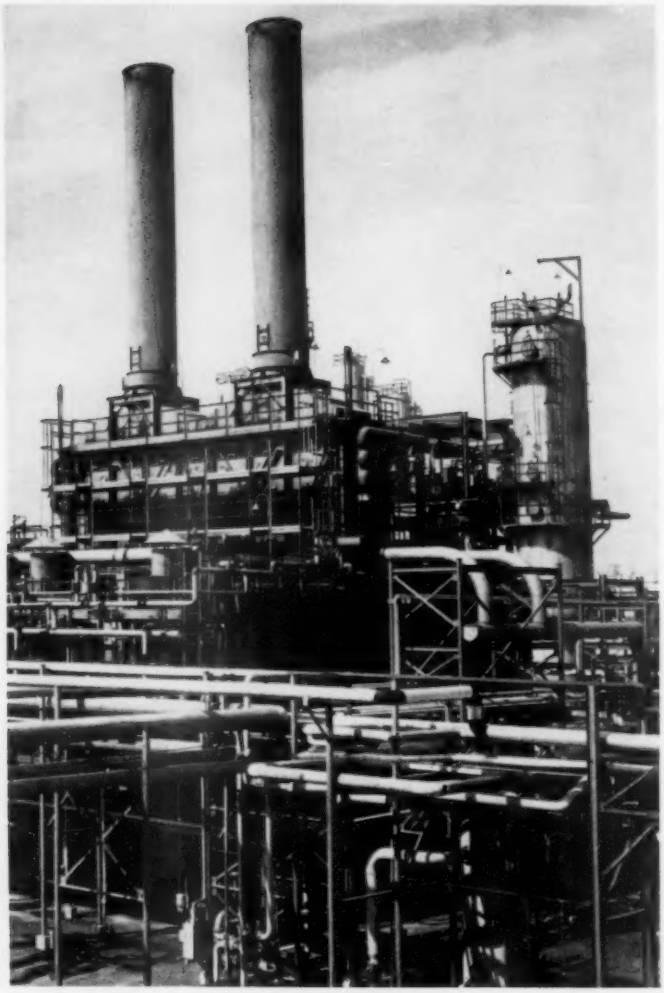
The erratic indications during the early part of the test were before the specimen became acclimated to the corroding system.

The method is gaining widespread use in refineries as the means of evaluating the effectiveness of inhibitors, and to study corrosion rates being experienced in various towers and process equipment. Results of a 3-month test made of corrosive conditions in an overhead accumulator are given in Fig. 8.

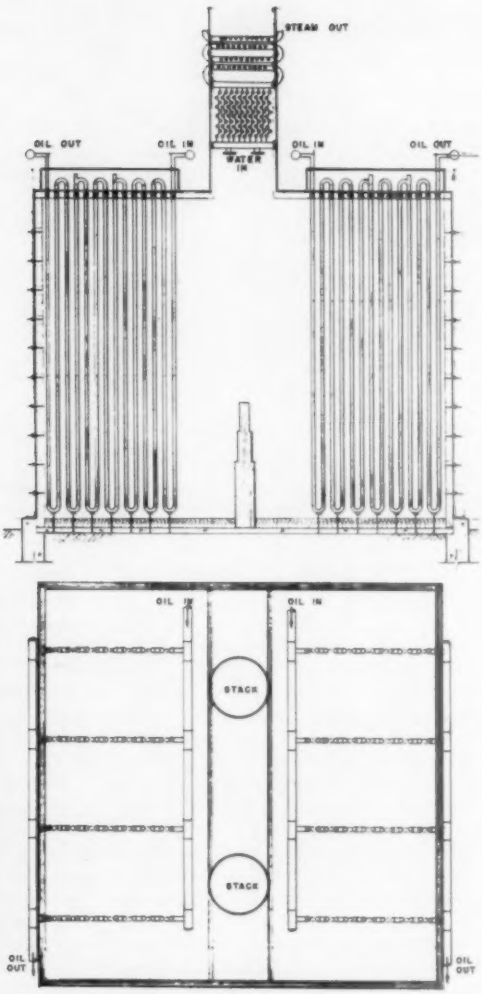
There was a marked change in stream material about midway during the test period. As shown, the corrosion rate more than doubled; from 2.8 m.p.y. to 7.2 m.p.y. By using probes to monitor corrosivity of process streams, as was done in this case, mitigation procedures can be started sufficiently early to protect expensive process equipment.

Several companies carrying out water floods are using the method to determine which corrosion inhibitors best fit their conditions.

At Newport Beach one company has probes installed on offshore structures and piers, for the purpose of determining corrosion rates which can be expected if offshore drilling is carried out from steel platforms. At Seal Beach, the method is being used to evaluate corrosive conditions inside the 8-in. submarine line leading to a drilling island 1½ miles offshore. **End.**



CHARGE HEATER for Houdriformer at Sun's Marcus Hook refinery was designed by new process. The heater is performing well.



IN NEW DESIGN, the process stream is heated entirely in the radiant section of heater. Lower drawing is sectional view. Fig. 1.

Newly Designed Process Heater Is Turning in Good Performance

by Ralph Morrow

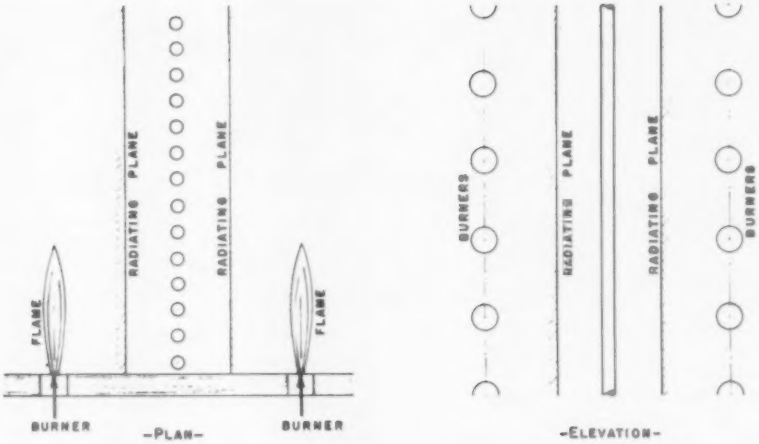
AN entirely new process-heater design now offers the refiner a more efficient utilization of costly radiant-section tube surface. The principle involved is the double-firing of vertically suspended tube banks.

The first heaters of this type were designed and built for use with a Houdriformer unit at Sun Oil Co.'s Marcus Hook (Pa.) refinery. Four such heaters were placed in service by Sun in November 1953, and, except during two normal shutdowns for equipment inspection, have operated continuously to date.

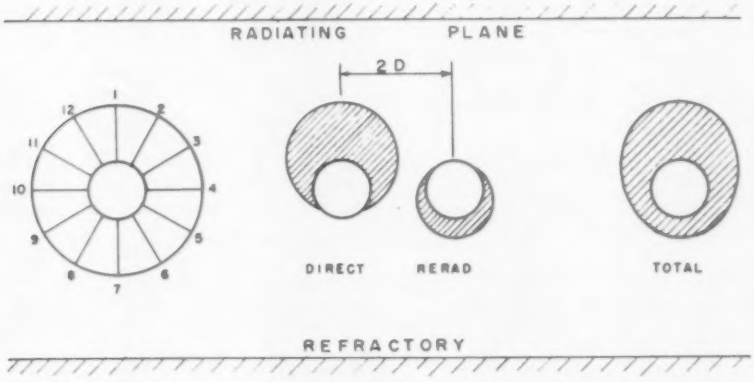
Later, three larger heaters of much the same design were built for use with a second Houdriformer, also at Sun's Marcus Hook refinery. Placed in service in August 1955, these latter three heaters are giving equally satisfactory performance.

REFINING

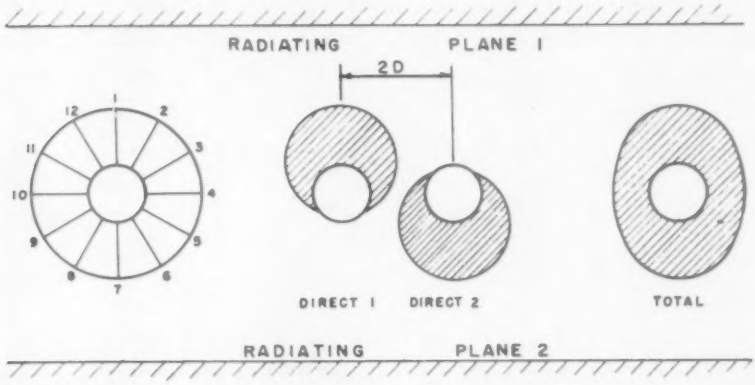
Heater description . . . The process stream is heated entirely in the radiant section of the heater, where the tubes are arranged in banks or coils disposed in a vertical position (see Fig. 1). Horizontally mounted burners supplied with preheated air are located at several ele-



DOUBLE FIRING of vertical tubes is provided for in the design. Fig. 2.



I. CONVENTIONAL WALL TUBES



II. DOUBLE-FIRED VERTICAL TUBES

COMPARISON OF HEAT FLUX, conventional wall tubes, and double-fired vertical tubes. Fig. 3.

vations midway between and on both sides of these vertical banks.

The direction of firing is thus in a vertical plane parallel to and on both sides of the plane of the tube bank (see Fig. 2). Since each of the tubes in each bank stands in the same vertical plane and receives an equal amount of heat from both sides, there is a minimum variation in the circumferential heat density around the tubes. Also, because of the location of burners at several different elevations, the longitudinal variation in heat density along the tubes is negligible.

The convection section of the heater, which has a horizontal tube arrangement, is situated on top of and lengthwise to the radiant section. The path of the exit flue gases from the firebox is upwards through the convection section, discharging through two top-mounted steel stacks. This convection section is designed to generate 450-psig. steam, part of which is diverted to supply the burner-air preheat, and the remainder of which is used for other process requirements. Actual design data are given in Table 1.

TABLE 1—DESIGN DATA FOR 18,000 B/SD HOUDRIFORMER CHARGE HEATER

Radiant section:	
No. of tube banks	8
No. of tubes	112
Size of tubes, in.	6 x 5
Surface, sq. ft.	5,725
No. of burners	80
Type of burners	Nat. Airoil oil and gas
Length x width x height, ft.	42 x 42 x 33
Firebox volume, cu. ft.	58,000
Convection section:	
Bare surface, sq. ft.	4,320
Extended surface, sq. ft.	11,200
Total	15,520
Design:	
Heat release, B.t.u./H.	167,500,000
Air preheat, B.t.u./H.	9,200,000
Total	176,700,000
Radiant-section duty, B.t.u./H.	103,000,000
Rate, B.t.u./H./sq. ft.	18,000
Convection section duty, B.t.u./H.	44,700,000
Rate, B.t.u./H./sq. ft.	2,880
Total steam generation, lb./H.	58,500
Steam to air preheaters, lb./H.	12,000
Net steam production, lb./H.	46,500
Net efficiency, per cent	82.7
Excess air, per cent	25
Stack temp., °F.	665

Double-firing analysis . . . An analysis of the principle of double-firing the radiant section tubes is given in Fig. 3. Shown is a graphical determination of

THE AUTHOR

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TABLE 2—EFFECTIVENESS OF SINGLE ROW TUBE BANKS

Point No.	I. Conventional wall tubes* Direct	Rerad.	Total	II. Double-fired vertical tubes† Direct from Plane 1	Direct from Plane 2	Total
1	1.000	0	1.000	1.000	0	1.000
2	0.918	0	0.918	0.918	0	0.918
3	0.676	0.027	0.703	0.676	0.080	0.756
4	0.336	0.115	0.451	0.336	0.336	0.672
5	0.080	0.232	0.312	0.080	0.676	0.756
6	0	0.315	0.315	0	0.918	0.918
7	0	0.342	0.342	0	1.000	1.000
8	0	0.315	0.315	0	0.918	0.918
9	0.080	0.232	0.312	0.080	0.676	0.756
10	0.336	0.115	0.451	0.336	0.336	0.672
11	0.676	0.027	0.703	0.676	0.080	0.756
12	0.918	0	0.918	0.918	0	0.918
Total	5.020	1.720	6.740	5.020	5.020	10.040
Average	0.418	0.143	0.562	0.418	0.418	0.837

$$\frac{\text{Maximum flux}}{\text{Average flux}} = \frac{1.000}{0.562} = 1.779$$

$$\frac{\text{Maximum flux}}{\text{Average flux}} = \frac{1.000}{0.837} = 1.195$$

Direct radiation

$$= \frac{0.418\,\pi\,D}{2D} = 0.657$$

Reradiation

$$= \frac{0.143\,\pi\,D}{2D} = 0.225$$

Total effectiveness = 0.882

Direct radiation from Plane 1

$$= \frac{0.418\,\pi\,D}{2D} = 0.657$$

Direct radiation from Plane 2

$$= \frac{0.418\,\pi\,D}{2D} = 0.657$$

Total effectiveness = 1.314

*Radiating plane on one side, refractory on other side; tube spacing at 2 diameters. †Radiating planes on both sides; tube spacing at 2 diameters.

the heat-flux pattern around the individual tubes in a conventional wall-tube-heater design as compared to the pattern around double-fired tubes.[1,2]

It will be noted in Table 2 that for a conventional wall-tube design with tube spacing at two diameters, the ratio of the maximum heat flux on the face of the tubes to the average heat flux around the tubes is approximately 1.8:1. For double-fired tubes at the same spacing, this ratio of maximum heat flux to average heat flux is reduced to approximately 1.2:1.

Of greater importance, however, is the fact that the total effectiveness of the tube banks in a wall-tube design is found to be only 0.882 (i.e., 88.2 per cent of a black body). Double-firing of the vertical tube banks increases their effectiveness by almost 50 per cent to a value of 1.314.

From this concept, it follows that for a given maximum heat flux on the face of the tubes, only two-thirds the total tube surface must be employed in this new design as is required for a wall-tube design. Another way of stating this is that two tubes fired on both sides will give the same radiant absorption as three tubes fired only on one side at the same rate.

Further, it is apparent that for a given pressure drop and the same maximum heat flux, the tube-wall temperature will be lower in the double-fired

TABLE 3—DESIGN AND SURVEY DATA FOR DOUBLE-FIRED VERTICAL TUBE HEATERS

Description—	H-1 Design	H-1 Actual	H-2 Design	H-2 Actual	H-3 Design	H-3 Actual†	H-4 Design	H-4 Actual
Radiant section:								
Charge, lb./H.	156,200	186,500	156,200	186,500	156,200	186,500	156,200	186,500
Temp. in, °F.	800	803	760	803	810	863	870	901
Temp. out, °F.	950	950	970	936	970	940	970	947
Duty, M.M. B.t.u./H.	20.000	29.076	29.700	28.026	24.100	10.277	15.400	11.855
Rate, B.t.u./H./sq. ft.	7,180	10,440	14,960	14,120	15,160	6,460	13,940	10,730
Per cent extraction	69.7	61.4	61.7	58.9	62.3	55.9	62.8	52.6
Exit gas temp., °F.	1,090	1,390	1,395	1,520	1,405	1,290	1,355	1,505
Convection section:								
					7,170	4,274	4,410	5,621
Duty, M.M. B.t.u./H.	3.960	10.359	9.220	10.764	9,400	5,200	5,780	6,900
Steam generation, lb./H.	5,190	12,700	12,080	13,200	2,540	1,515	2,080	2,650
Rate, B.t.u./H./sq. ft.	740	1,925	2,400	2,790	5.0	3.7	4.2	4.5
U, B.t.u./H./sq. ft./°F.	2.5	4.4	4.8	4.8				
Combustion:					54,100	13,320	34,250	16,030
Fuel gas, S.C.F./H.	40,200	33,615	67,100	33,570	680	1,360	680	1,360
Net heating value, B.t.u./cu. ft.	680	1,360	680	1,360	15	57	15	47
Per cent excess air	15	17	15	21	740	615	740	743
Stack temp., °F.	600	609	740	722				
Over-all:					36,800	18,115	23,300	21,801
Heat release, M.M. B.t.u./H.	27.300	45.716	45.700	45.655	1.870	0.276	1.180	0.733
Air preheat, M.M. B.t.u./H.	1.390	1.628	2.320	2.038				
Total	28.690	47.344	48.020	47.693	38.670	18.391	24.480	22.534
Per cent efficiency	82.5	82.7	80.0	80.5	80.0	78.8	80.0	76.8
Per cent stack loss	13.5	13.3	17.3	16.5	17.2	18.2	17.2	20.2
Per cent setting loss	4.0	*4.0	2.7	*3.0	2.8	*3.0	2.8	*3.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*Assumed. †Upset reactor. Only half-firing.

TABLE 4—TUBE-WALL TEMPERATURE SURVEY—18,000 B/SD HOUDRIFORMER CHARGE HEATER

Location—	Coil— No. 1 (°F.)	No. 2 (°F.)	No. 3 (°F.)	No. 4 (°F.)
North side:				
Middle tube	941	978	960	892
Outlet tube	1,055	1,025	1,038	1,038
South side:				
Middle tube	934	973	923	863
Outlet tube	1,072	1,038	1,010	1,016

Operating conditions:

Charge rate, lb./H. naphtha vapor, incl. 9.8 wt. per cent hydrogen	303,000
Inlet temperature, °F.	640
Outlet temperature, °F.	910
Calculated duty, B.t.u./H.	83,000,000
Surface, sq. ft.	5,725
Average rate, B.t.u./H./sq. ft.	14,500
Max. rate (i.e., 1.2:1), B.t.u./H./sq. ft.	17,400

Coil description:
Eight-pass arrangement, 6 x 5-in. tubes, 2¼ Cr 1 Mo.

Calculation of "clean" tube-wall temperature: For film coefficient, from McAdams[3]

$$\text{Formula } h = 0.0144 \times \text{Spec. Ht.} \times G^{0.8}/D^{0.2}$$

where Spec. Ht. = 1.013, G = 277,000 lb./H./sq. ft. and D = 5 in./12

$$h = 0.0144 \times 1.013 \times (277{,}000)^{0.8}/(0.417)^{0.2} = 390.$$

$$\text{Film drop} = \frac{17{,}400 \times 6 \text{ in.}/5 \text{ in.}}{390} = 53.5°.$$

For metal, where k = 200 B.t.u./H./sq. ft./in./°F.

$$\text{Metal drop} = \frac{17{,}400 \times 0.5}{200} = 43.5°$$

"Clean" tube-wall temperature = oil temperature + film drop + metal drop

$$= 910° + 53.5° + 43.5°$$

$$= 1{,}007° \text{ F.}$$

vertical-tube arrangement, than in a wall-tube design because the mass velocity will be greater while the tube travel is less. This is of value in obtaining maximum heat transfer within a range of safe-operating conditions.

Plant tests . . . Evidence that this analysis is justified has been obtained in actual plant operation. Table 3 gives a comparison between design and survey data for the first group of four heaters built at Marcus Hook. Examination of the data will show that the radiant extraction obtained is well within the range to be expected when account is taken of the rate of firing, fuel heating value, excess air, etc.

Table 4 gives the results of a tube-wall-temperature survey made on the second Houdriformer charge heater. Shown is the method of calculating the "clean" tube-wall temperature of 1,007° F. based upon a maximum flux rate of 17,400 B.t.u. per hour per sq. ft. Actual measured temperatures ranged from 1,010° to 1,072° F. It is interesting to note that subsequent internal inspection of the tubes showed them to be scaled, with the pattern of scaling identifiable with the higher tube-wall temperatures.

These heaters have demonstrated their flexibility in operation to the extent that when radiant-section duty requirements have been low, large quantities of steam have been generated in the convection sections by increasing the per cent excess air. It has also been found that the use of preheated air to the burners is optional with regard to the efficiency of the heaters.

Other advantages . . . Other process advantages offered by this new design include the ease of making series-parallel coil arrangements. With the proper attention to coil arrangement, any shape time-temperature curve may be easily obtained.

The design lends itself readily to firing with either oil or gas. Burners may be individually controlled, or automatic instrumentation of whole banks of burners may be used.

This new type of heater has many structural and mechanical advantages. Because the vertical tubes are suspended at the top and are merely guided at the bottom, they remain perfectly straight at high-temperature levels. This suspension-guide arrangement also eliminates the necessity for intermediate tube supports, which are often expensive to purchase and costly to maintain.

The top tube sheets are designed with slotted holes which makes it feasible to completely shop-fabricate and heat-treat the coils prior to their installation in the heater as assembled units. The coils can, of course, be removed in the same manner for replacement and repair. Ground space requirements for tube removal are very small.

It should be noted that for services requiring frequent internal inspection and maintenance of the tubes, this heater may easily be elevated and bottom header boxes provided.

The original development of the design of these heaters was done jointly by the Alcorn Combustion Co. and Sun Oil Co.'s engineering division.

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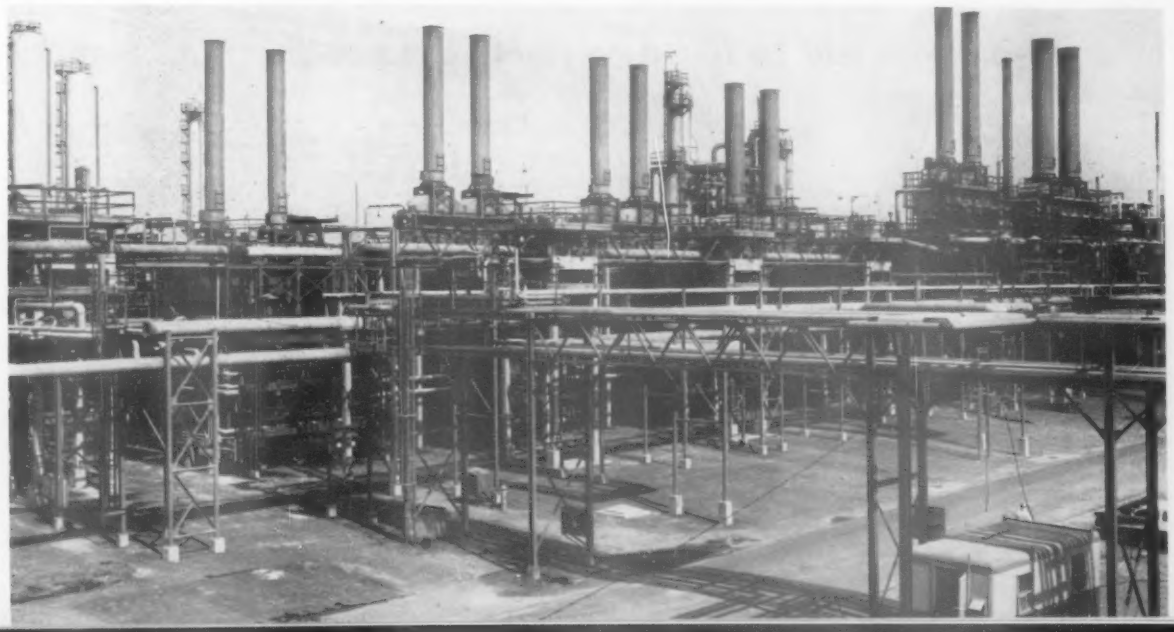
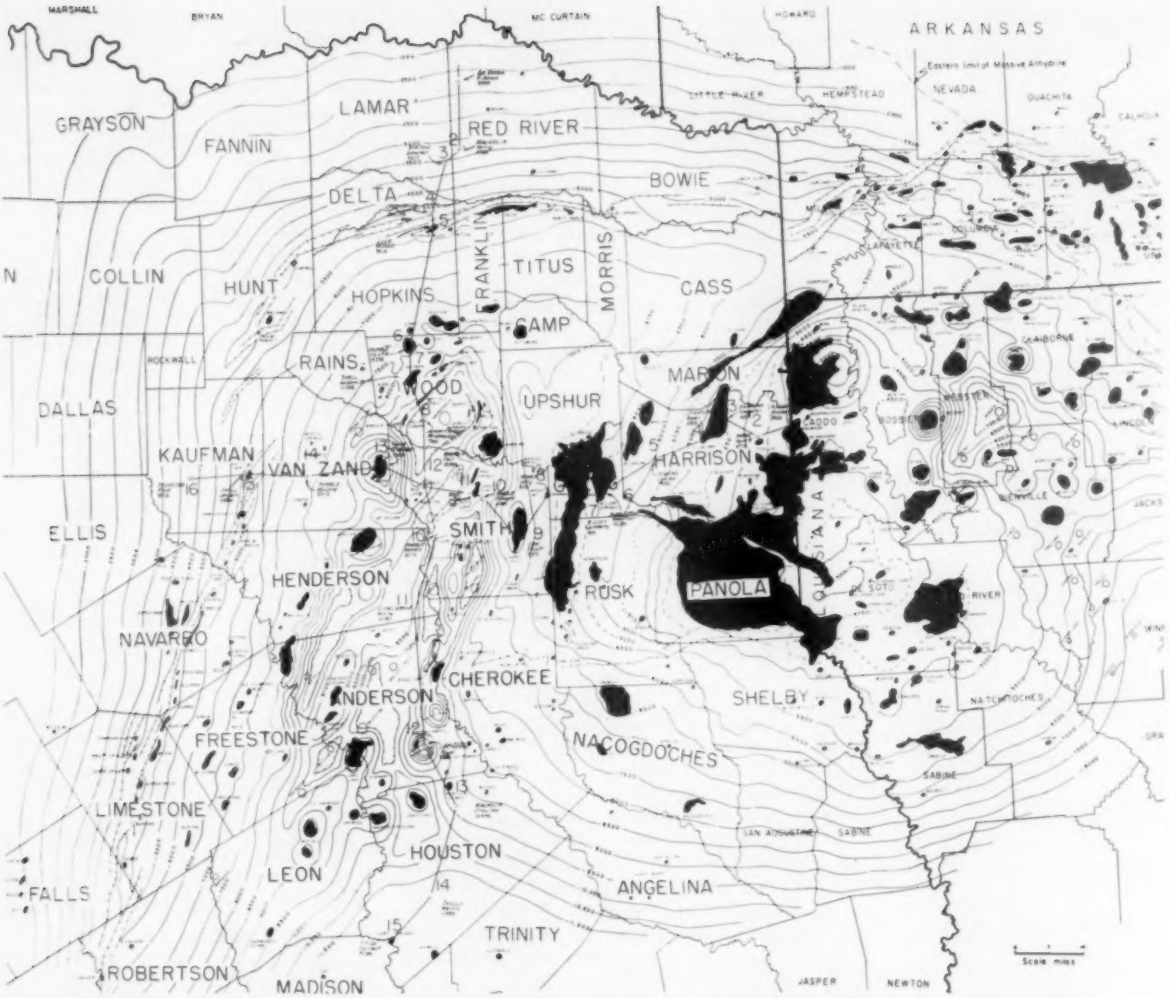
BATTERY OF NEW HEATERS at Sun's Marcus Hook refinery. Total design firing rate for these heaters is over 400 million B.t.u. per hour.





SUBSURFACE STRUCTURE of Northeast Texas mapped on Massive anhydrite base; contour interval 500 ft. (Courtesy R. W. Eaton). Fig. 1.

East Texas Basin Hides Deep Prospects

Strat traps will be found on flanks of large structural features

by Lester A. Coon

THE East Texas basin is that portion of East Texas bounded on the west and north by the Woodbine outcrop and on the east by the Sabine uplift which crests near the Texas-Louisiana line. Geographically, the west edge falls in Hill, Tarrant, and Denton counties, and the north edge coincides with Red River. The south edge is near the Jackson (Fayette)-Yegua outcrop in Madison and Trinity counties (Fig. 1).

The axis of the basin (Fig. 2) extends northward from Houston County through Anderson and Smith counties to Wood County, then curves sharply eastward through Camp to Cass County. Its deepest part centers near the Hainesville dome in Wood County, and is commonly referred to as the Mineola basin.

Author is district geologist, The Texas Co., Tyler, Tex. This paper was read at the sixth annual meeting of the Gulf Coast Association of Geological Societies at San Antonio, 1956. It is presented here, courtesy of the G.C.A.G.S. and The Texas Co.

General Geology

The geology of the East Texas basin is best described with the east-west cross-section across the basin as a background (Fig. 3). The section extends from the north end of Waskom field on the east, to Woodlawn field in Harrison County, thence to Willow Springs field in Gregg County, across East Texas field in Gregg County, to Wright Mountain field in Smith County. It then trends northwestward across the Sand Flat-Red Springs dome in Smith County to the Van dome in Van Zandt County,

thence westward across the Mexia-Talco fault system in Kaufman County.

The maximum thickness of Tertiary and Cretaceous sediments in the deepest part of the basin has never been drilled, but it is reasonable to suspect that it exceeds 15,000 ft. Slightly over 11,000 ft. of this total are Cretaceous sediments containing numerous prospective horizons. These horizons have yielded approximately 4,420,270,165 bbl. of oil as of January 1, 1956, and there is approximately 5 billion barrels of liquid hydrocarbon remaining as established reserves.

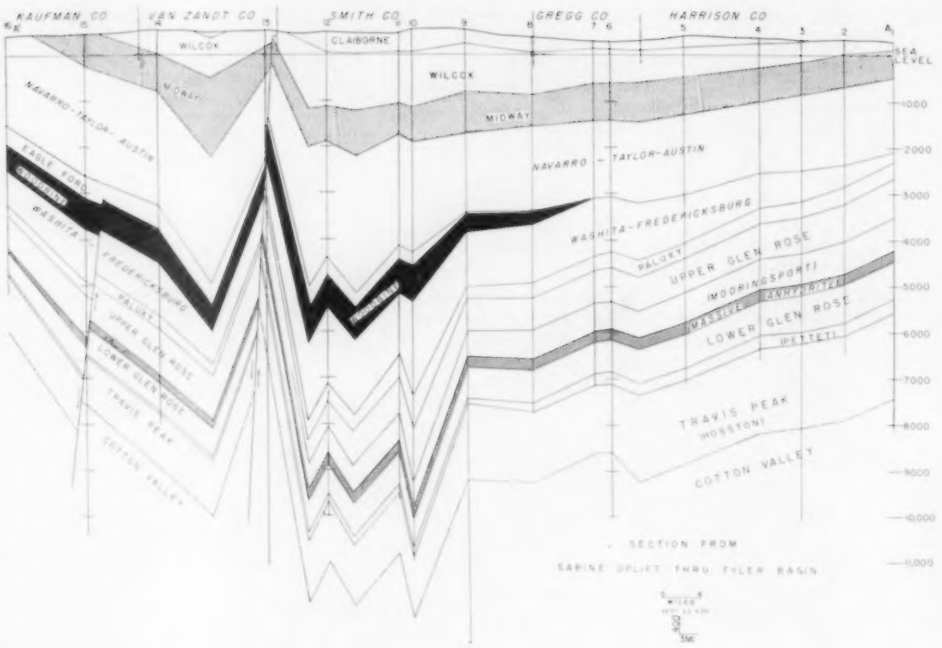
This 10 billion barrels, more or less, makes the East Texas basin one of the most richly productive sedimentary basins on this continent to date.

There has been no substantial Tertiary production in the basin, although the extreme south edge is probably prospective.

Lower Cretaceous . . . The East Texas basin is at least as old as the Jurassic and was a well-developed basin by the beginning of Lower Cretaceous deposition. Growth of the basin continued slowly from semicontinental types of sands and red beds of the Travis Peak, through the marine Glen Rose section followed by sand and shale of the Paluxy with no major unconformity. The slow growth of the basin during the marine sedimentation of the Glen Rose probably caused the elongate narrow bands of porosity in the Pettet, such as South Hallsville field and similar ones on the flanks of the Waskom field structure.

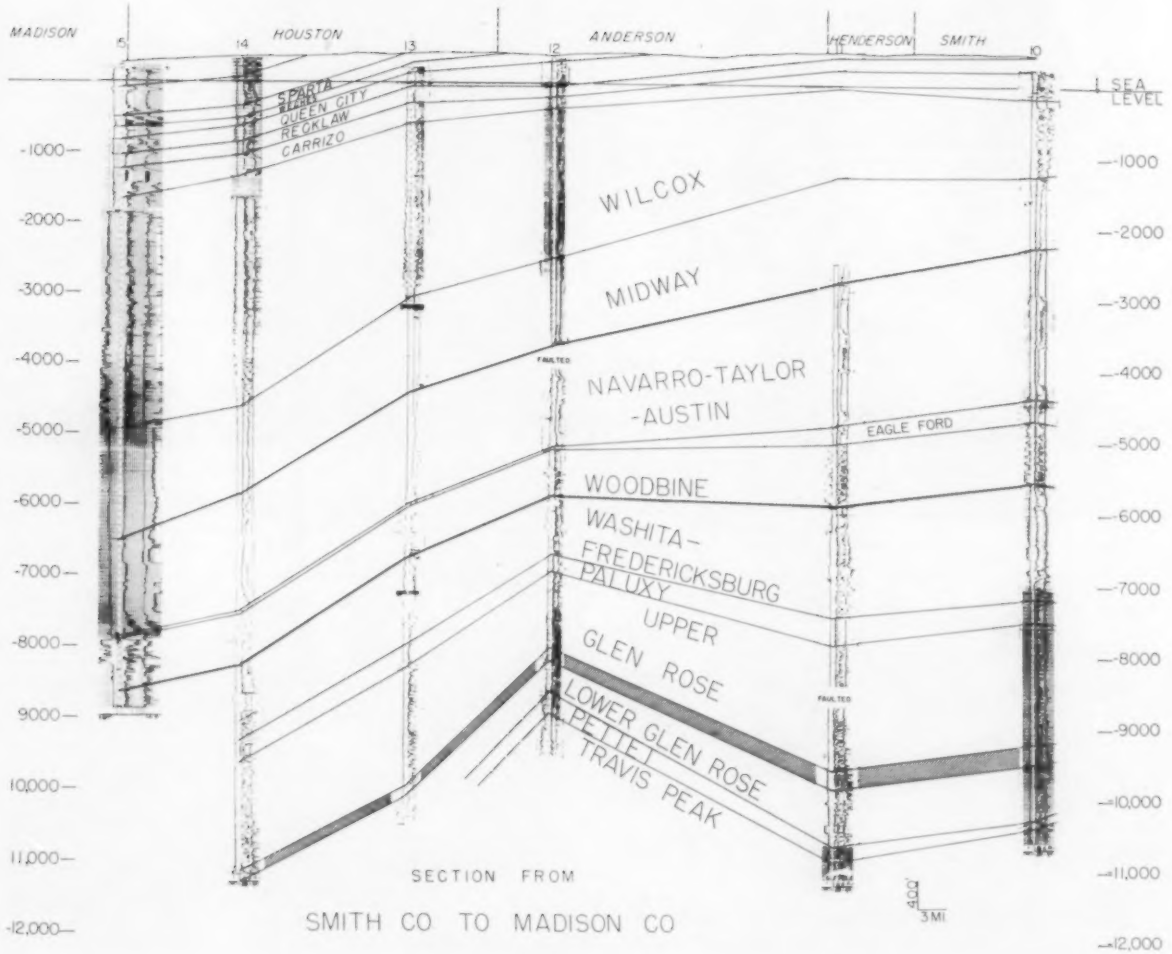
They appear to be characteristic of onlap or offshore bar types of deposits in shallow water paralleling relatively positive areas. The Washita-Fredericksburg seas overlapped the Trinity with a rhythmic series of limestones and shales. The first really major unconformity occurred at the end of Washita deposition and resulted in the uplifting and erosion of the Sabine uplift. At least 3,000 ft.

MAJOR STRUCTURAL features of Northeast Texas. Future prospects for oil and gas lie in stratigraphic traps on the flanks of the larger structural features. Fig. 2.



EAST-WEST cross-section of the East Texas basin (Harrison County to Kaufman County). Fig. 3.

NORTH-SOUTH cross-section (below) from Red River County to Smith County. Opposite page shows north-south cross-section from Smith County to Madison County. Fig. 4.



"The wealth of Cretaceous subsurface control indicates most major structural features have been mapped."

of Lower Cretaceous sediments was truncated from the crest of that uplift.

Upper Cretaceous . . . Deposition of the Upper Cretaceous began with massive sands of the Woodbine followed by the predominantly shale section of the Eagle Ford. At the close of Eagle Ford time, another significant unconformity occurred resulting in the truncation of the Eagle Ford and Woodbine on the Sabine uplift. Both formations were then progressively overlapped by the impervious Austin chalk. This resulted in the ideal conditions that trap the oil in East Texas field.

The presence of a coarse conglomerate on the extreme east edge of East Texas field suggests that the conglomerate is lower Woodbine and that the Woodbine was never deposited much farther east than its present position.

The beginning of Upper Cretaceous deposition coincided with a rejuvenation of the East Texas basin in the form of continuous downwarping with spasmodic periods of more rapid growth. It appears that these latter stages of rapid growth coincided largely with Eagle Ford and Taylor time. These periods resulted in structural phenomena which are peculiar to the Mineola basin, the deepest part of the East Texas basin.

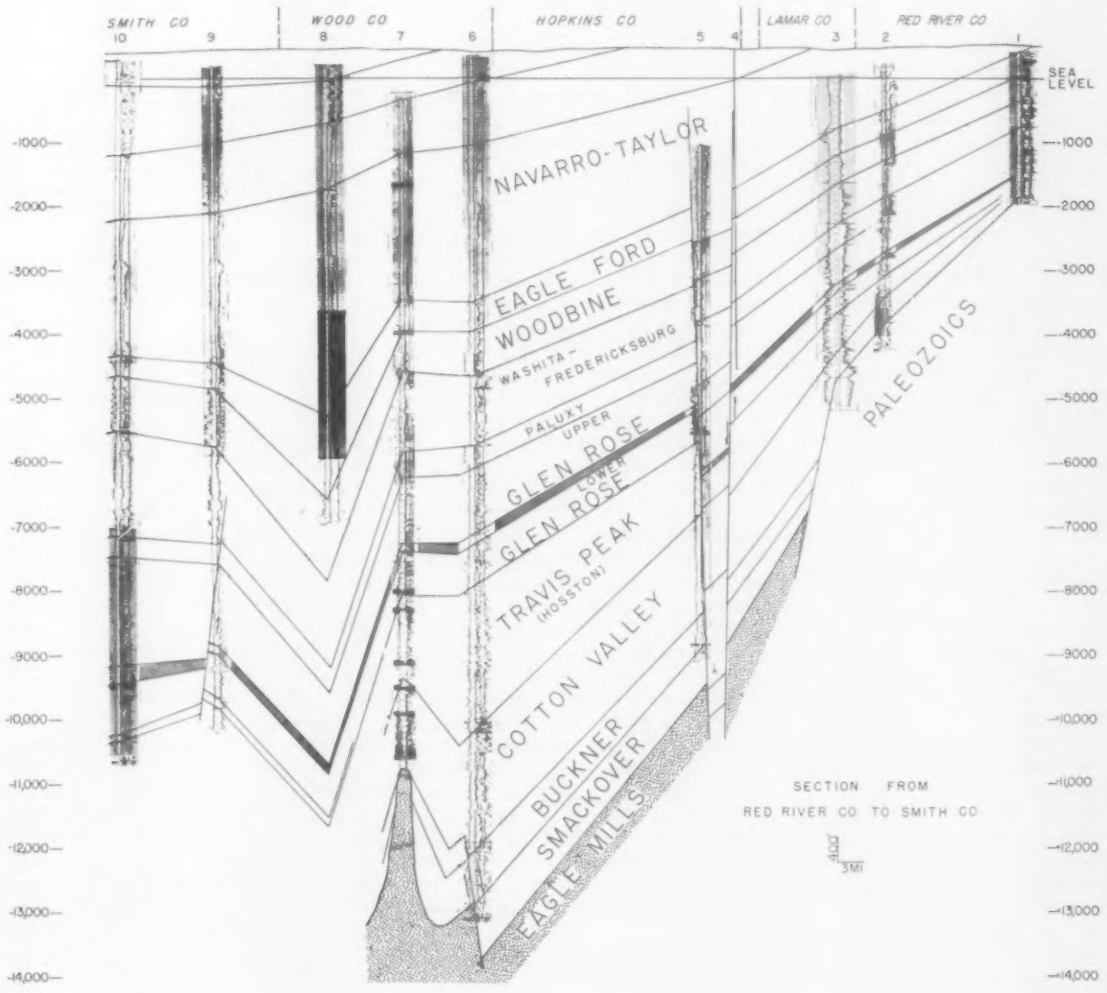
These are:

1. Practically all regional strike faults are upthrown to the basin.

2. The order of throw of faults, with the maximum displacement in the Upper Cretaceous, decreases rapidly in younger and older sediments. For example, Pine Mills field fault has a throw of approximately 250 ft. at or near the base of Austin chalk, but does not appear to be expressed at Paluxy level.

The end of Upper Cretaceous deposition was marked by a period of truncation at the outcrop, but the basin as a whole was quickly submerged by Midway seas. Consequently, the truncation of the Upper Cretaceous beds was probably not as severe as the erosion of the surface of the Lower Cretaceous. The greater truncation of the Lower Cretaceous was due to the broad regional effects of the Sabine uplift at the end of Lower Cretaceous deposition.

Tertiary . . . Progressive downwarping of the East Texas basin continued during Midway and Wilcox time with predominantly marine sedimentation. Wilcox sedimentation suggests a shallow-water, lagoonal type of environment because lignite, pyrite, and glauconite are



generously interspersed with sands and gray shales.

Surface and subsurface evidence suggests another short period of rapid downwarping during Claiborne time. The Sabine uplift had its third great period of uplift at the close of Claiborne deposition when all of the Claiborne and a substantial part of the Wilcox was eroded from the uplift.

Structural Implications

Unfortunately, the degree of vertical exaggeration in Section A-A′ gives an erroneous impression of dip and thickness (Fig. 3). The rate of dip on the top of the lower Glen Rose, Rodessa formation, is very much greater than it is on top of the Upper Cretaceous; this reflects the rapid downwarping of the basin during Upper Cretaceous deposition.

The major features reflected on the section are:

1. The truncation of the Washita-Fredericksburg section at the east side of the section.

2. The Willow Springs anticline at wells numbered 6 and 7.

3. The truncation of the Eagle Ford and Woodbine sections which are overlapped by the Austin chalk, forming the stratigraphic trap of East Texas field. Incidentally, the east edge of the Eagle Ford approximately coincides with the original west edge of the field. This field had produced 3,159,807,267 bbl. of oil as of January 1, 1956.

4. The Red Springs-Sand Flat dome at Well No. 11. A curious feature of this structure is that there is approximately 350 ft. of closure on top of the Woodbine, yet there is no Woodbine production anywhere on the structure, even though isopachous thinning is indicated all through the Upper Cretaceous. As a matter of fact, none of the major structures in Smith County have Woodbine production.

5. The Lindale-Bud Lee anticline at Well No. 12. This regional feature is about 12 miles long and has scattered gas production from the Rodessa and oil from the Paluxy.

6. The Van structure, at Well No. 13, has about 1,500 ft. of closure at Woodbine level and is the most prominent producing structure in the East Texas basin.

The north-south section, Red River County to Smith County (Fig. 4) shows the relationship of the Cretaceous to the older Jurassic beds and Paleozoic floor. The progressive overlap of the younger Trinity beds is shown as well as the overlap of the Jurassic in Lamar County.

The actual updip limit of the salt cannot be measured accurately, nor is its relationship to the Talco graben known, although it is believed that the faulting does extend to the Paleozoic floor and is part of rejuvenated Paleozoic faulting.

"The recent discovery of oil in the Woodbine on the Hainesville dome in Wood County and the Bethel dome in Anderson County proves that the interior shallow piercement-type domes . . . are highly prospective . . ."

The magnitude of the unconformity at the end of Upper Cretaceous deposition is indicated to be much greater on the north-south section than it is on the east-west section. The Sabine uplift was located too far out into the Navarro basin to have been affected by the unconformity.

A fault is shown in the Buckner in Well No. 6, Humble 3 Yantis Gas Unit, Yantis field, Wood County. This fault is postulated and cannot be proved at this time, but the well did not encounter Smackover before penetrating salt. The absence of the Smackover has been the rule rather than the exception in recent deep Smackover drilling in Rains and Wood counties, suggesting that regional faulting of Jurassic age may be present which is not expressed in younger beds due to Jurassic erosion.

The absence of the Smackover in the Shell-Goldsmith test in Quitman field, Well No. 7 on the north-south section, is attributed to pinchout and/or erosion rather than faulting due to the fact that the Quitman field structure is a deep-seated salt dome of some magnitude. The salt penetrates some of the overlying sediments similar to a shallow piercement type of salt dome.

The Upper Cretaceous age of the Mineola basin is well illustrated by the extremely rapid rate of thickening of the Upper Cretaceous formations in the Jackson et al. Wisenbacker in Wood County—Well No. 8 on the section. The Taylor, Eagle Ford, and Woodbine growth of the Mineola basin is particularly well illustrated and indicates the age of much of the faulting in Wood County. It may also account for the rather rapid decline in throw of some of the faults in younger and older beds.

Thinning of the Upper Cretaceous and the Washita-Fredericksburg intervals at the south end of the north-south (Smith County to Madison County) cross-section (Fig. 4) is considered to be particularly significant because it indicates the presence of a south rim and the East Texas basin was a closed basin during Upper Cretaceous deposition.

This south rim was in the form of a narrow regional shelf with resultant isopachous thinning and deposition peculiar to the shelf area. There are unconformities present which correlate with similar ones on the Sabine uplift suggesting that the shelf may have been a spur of the Sabine uplift. Other evidence suggesting the presence of the south rim are:

1. Massive porous limestone in the Rodessa section in southernmost Houston and Trinity counties.

2. Truncation of the Kiamichi, Maness shale, and Eagle Ford shale from wells in Trinity County. Limitations of the vertical scale do not permit showing the correlations indicating the postulated truncations.

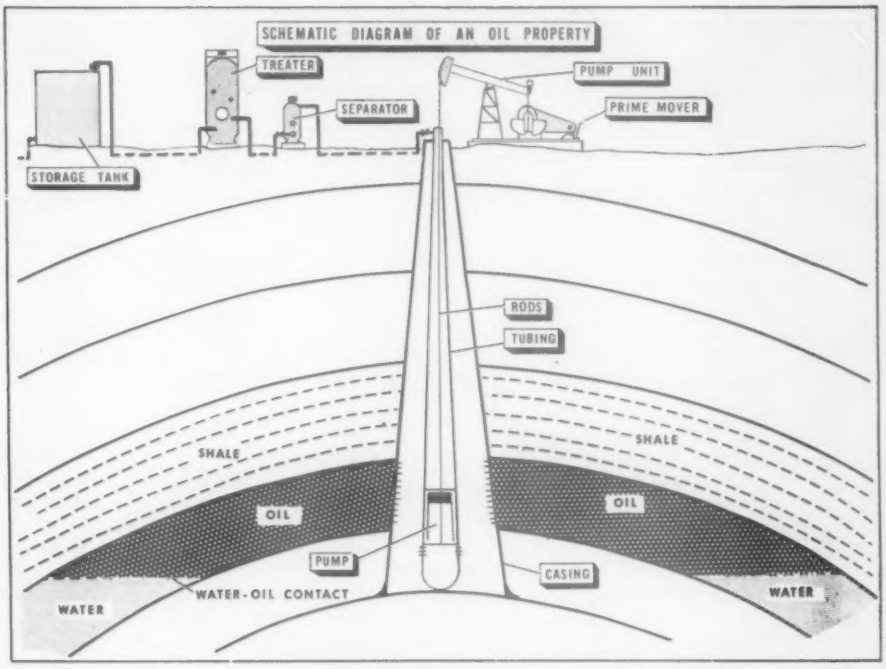
3. Lastly, and this is thought to be conclusive, the absence of sand in the Woodbine west and south of a line extending from southern Trinity through Madisonville in Madison County to Flynn in Leon County, then to the Woodbine outcrop in northern McLennan County. Here the Woodbine is overlapped by the Eagle Ford, and indicates a relatively positive area of nondeposition existed during Woodbine time. Subsequent southward tilting of the basin in the downwarping of the Gulf Coastal Plain has obscured the shelf.

Future Prospects

The East Texas basin has been the most profitable producing area developed in the United States, considering the relatively small geographical size of the area, depths to principal objective horizons, and established reserves. The wealth of Cretaceous subsurface control indicates most of the major structural features have been found and mapped. But pre-Cretaceous exploration of these features has only started. Results have been encouraging, considering the large size of the features and the limited number of deep tests on most of them.

Stratigraphic traps, with significant reserves in the Cretaceous, will be found on the flanks of the large structural features. The recent discovery of oil in the Woodbine on the Hainesville dome in Wood County and the Bethel dome in Anderson County proves that the interior shallow piercement type domes of the East Texas basin are highly prospective, and they will probably be focal points of exploratory interest in the future. **End.**

THE WHOLE must be considered but, of course, the engineer's biggest job is to establish the oil reserves. Fig. 1.



So you're a young engineer and want to know how to go about . . .

Evaluating an Oil Property

One of the most important jobs facing the evaluating engineer is to determine how much oil lies in the property and how fast it can be recovered. Here are the primary steps in defining the oil reserves. The next part will show how their worth is determined.

by E. A. Polumbus, Jr.

Part 1 of Two Parts

THE two principal objectives of an oil-property evaluation are: (1) to establish the net amount of cash to be realized in future years by present owner of the property; and (2) to establish a fair market value of the property or the value of the property in a transaction between buyer and seller. To arrive at these objectives, the evaluation engineer must provide answers to pertinent questions fundamental to the following five component parts of an evaluation:

- **Determination of oil reserves:** How many gross barrels of oil can be recovered from the property? At what rates can the oil be recovered? How much time will it take to produce the oil?

Author is petroleum consultant, Denver. Article is a portion of an address presented at the second annual Rocky Mountain Mineral Law Institute, 1956, in Boulder, Colo. It is part of a book of the proceedings published by Matthew Bender & Co., Albany, N. Y

- **Participation:** How is the gross oil to be divided among working-interest owners? How much is due royalty owners?
- **Value:** What price will be received for future recoverable oil?
- **Operational expense:** How much will it cost to produce the oil?
- **Investment and salvage:** Are any further capital expenditures anticipated? What will lease and well equipment be worth when the oil reserves are depleted?

The oil property is analyzed by the evaluation engineer with the above questions guiding the various steps of procedure.

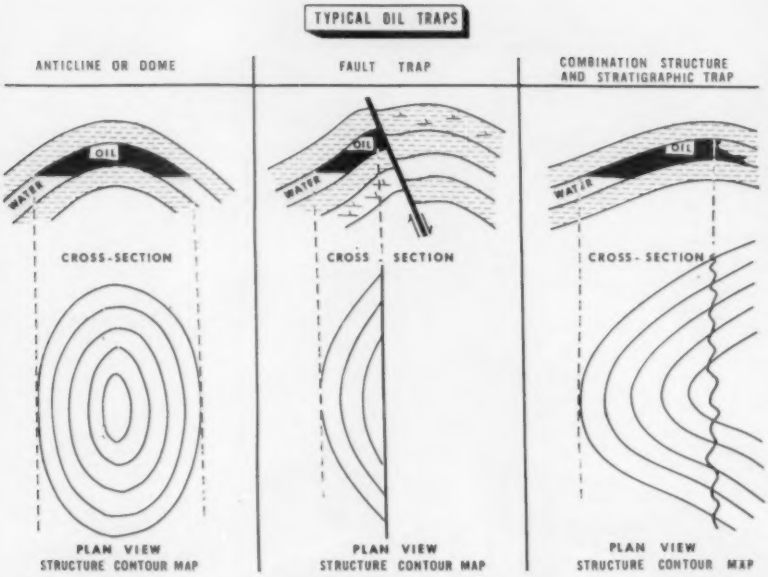
Oil Reserves

Reservoir limits . . . After assembling data on the type of oil accumulation and making an intensive study of all available data on reservoir rock characteristics, the engineer can proceed with the job of defining the oil reservoir. Fig. 5 shows in a simplified manner how the limits of an oil reservoir may be determined. Well No. 1 penetrated the water zone in the objective formation. Well No. 2 found the oil-water contact. Wells No. 3 and 4 showed thinning of the pay and Well 5 indicated the pinchout.

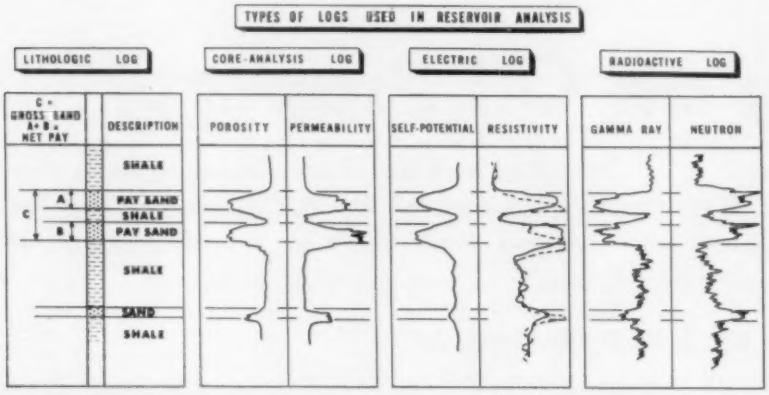
Study of all wells in the field in a similar manner defines the vertical and lateral limits of the oil productive portion of the reservoir. In actual practice, however, this process is often very difficult because of incomplete, inadequate, or conflicting information.

Concurrent with this type of analysis, the evaluation engineer prepares maps that aid in establishing the volume of oil originally in place in the reservoir. Fig. 6 shows two of the most commonly used and most essential maps in reservoir engineering.

It will be seen that these two maps define the reservoir in all three di-



TYPE OF OIL ACCUMULATION is the first point of interest in examining the reservoir. Fig. 2.



WAYS TO SHOW CHARACTERISTICS of reservoir rock range from geologist's description at left to lab analysis and wire-line logs. Fig. 4.

mensions. From these maps the evaluation engineer can determine the areal extent of the reservoir and the total volume of productive reservoir rock.

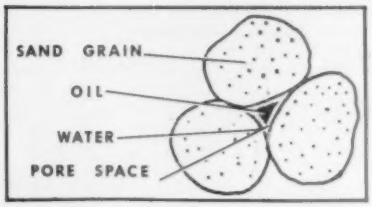
Characteristics of fluids . . . Although the characteristics of the water and of the gas in the oil reservoir are considered in a comprehensive reservoir study, only the characteristics of the reservoir oil are considered here.

Fig. 7 shows three of the more important fluid characteristics of interest to the engineer, namely, gas solubility, oil viscosity, and shrinkage. The relationships set forth here in graphic form have been derived from an analysis of a sample of a typical reservoir oil.

When the reservoir oil is lifted to the surface and placed in storage tanks, pressure is decreased and dissolved gases separate from the oil, thus shrinking the volume of the original liquids. The characteristics of shrinkage, or of the reservoir volume factor as it is sometimes called, is essential in volumetric calculations of oil reserves.

Energy mechanisms . . . In most reservoirs natural energy is available to move the oil to well bore because the oil is trapped under conditions of relatively high pressures and temperatures. There are five important ways in which natural energy within the reservoir may be effective. They are: (1) Reservoir rock and fluid expansion; (2) free (external) gas cap; (3) solution (internal) gas; (4) water drive; and (5) gravity drive. These five energy sources may act independently in any particular reservoir, or they may act in combination.

The importance of the recovery mechanism is apparent from the wide



ROCK NATURE must next be studied to determine porosity, permeability, and amount of oil and water in the pore space. Fig. 3.

variation in recovery efficiency expectancies. Solution-gas drive may effect recoveries of 5 to 35 per cent of the original stock-tank oil in place, leaving a large percentage of oil in the reservoir unrecovered at depletion. A gas-cap drive may effect recoveries in excess of 25 per cent, and in combination with gravity drainage may recover as high as 60 per cent. A water drive is considered an efficient natural-recovery mechanism, and recoveries ranging from 35 to 65 per cent of the stock-tank oil in place have been recorded.

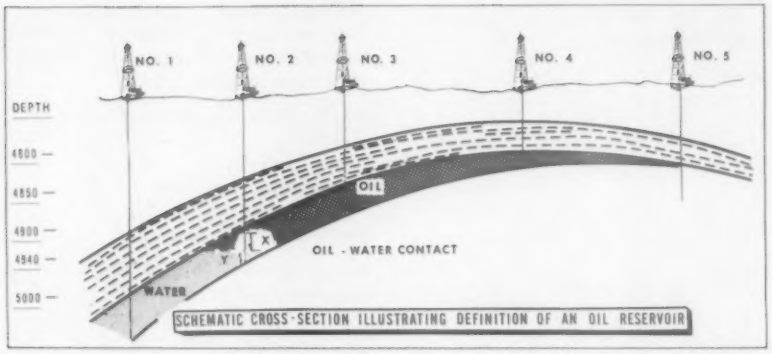
Gravity drainage and reservoir rock and liquid expansion are supplemental to other forms of energy and seldom act independently.

The actual effectiveness of any one, or any combination, of recovery mechanisms depends on numerous factors peculiar to a given reservoir. Early development and exploratory wells may give some evidence which could point to the type recovery mechanism or mechanisms that might later prove to be the effective sources of energy.

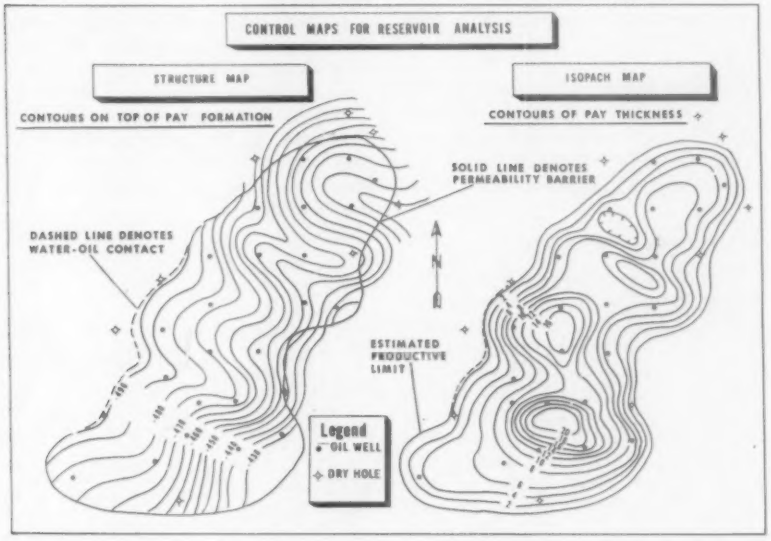
Usually early development will show whether or not a gas cap is present. Early development might also present evidence of the continuity of the reservoir rock. If the reservoir rock is lenticular and no gas cap is present, the engineer could conclude tentatively that the source of energy is solution gas. On the other hand if the evidence indicated that the reservoir rock was continuous over a broad area and was water-bearing below the oil reservoir, the engineer would recognize the possibility of a water drive.

Before the engineer can establish more conclusively the energy mechanism or combination of mechanisms effective in a given reservoir, he needs to know the producing behavior of the reservoir. Sometimes it is necessary to accumulate producing data over a peroid of years before the active sources of energy are definite.

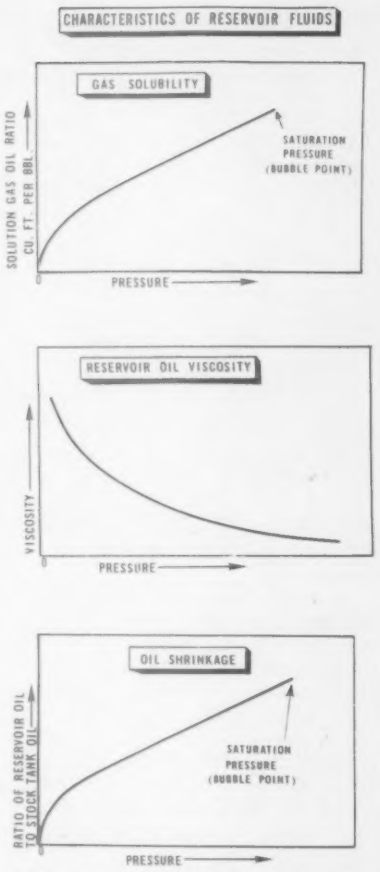
Producing characteristics . . . In the first stages of the producing life of the reservoir, the engineer studies the initial producing characteristics in relationship with the rock and fluid characteristics. Sometimes for unex-



RESERVOIR LIMIT is determined from development wells as the next step in defining the reservoir. Fig. 5.



RESERVOIR MAPS then follow as a means to establishing the volume of the reservoir. Fig. 6.



FLUID CHARACTERISTICS are important in calculating oil reserves from producing data. Fig. 7.

plainable reasons the initial productivities of wells in a reservoir are abnormally low. In this event the engineer must prudently hold his opinions of recovery efficiencies to low values until, if possible, the reason for the low productivity has been determined and successful corrective measures taken.

As more producing history becomes longer and oil, gas, and water production and reservoir pressures are accurately recorded, calculations can be made to ascertain the type of driving mechanism and recovery efficiencies. Such calculations are of the "material balance" type.

If the calculations should indicate that a water drive might be present, an important policy decision could be made to restrict producing rates so that oil withdrawals would balance external water influx and thereby efficiently utilize the energy of the acquifer. If a potential water drive of limited but commercial magnitude were present and oil-withdrawal rates were not controlled to efficiently utilize the water energy, the solution-gas drive would predominate and a considerable loss of oil would result.

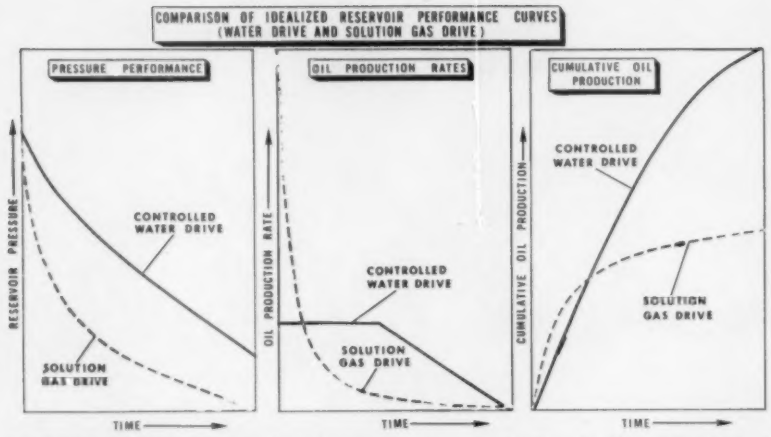
Fig. 8 compares the performance characteristics of a relatively inefficient solution-gas type of drive with the more efficient water-drive type of reservoir.

It is assumed that the water drive is controlled by restricting oil withdrawal rates in such a manner that the reserves will be depleted in the same time for both mechanisms. Thus with water drive initial producing rates are only 25 per cent of the capacity rates, whereas the solution-gas-drive rates reflect capacity at all times. With soluption-gas drive, an extremely sharp decline is noted in the early producing life, and rates decrease to very low values. With water drive the restricted rates are maintained throughout a large part of the producing life. The graph on the right of Fig. 8 shows that the solution-gas drive yields about half total oil recovered with water drive.

Future rates . . . The decline trends in solution-gas-drive reservoirs usually follow a hyperbolic type curve of the type indicated on Fig. 8. The characteristics of the curve are dependent upon the amount of oil in the reservoir, the amount of energy available, the type of oil, and the permeability of the reservoir rock.

After the trend has become sufficiently established, a prediction could polating the decline curve mathematibe made of future recoveries by extracally or graphically as shown in Fig. 9. Both gas and oil are depleted in a solution-gas-drive reservoir; this type of reservoir is sometimes referred to as a depletion type of reservoir.

In a combination gas-cap and solution-drive reservoir, production rates are often wisely allocated and restricted to minimize the amount of gas produced per barrel of oil, thus more efficiently utilizing the energy from the compressed gas. Extrapolation of production decline rates under these conditions must therefore take into consideration the influence of free gas expansion. In reservoirs of this type,



ENERGY MECHANISM determines to a large part how much oil production can be obtained from the primary investment. Fig. 8.

excessive gas, in conjunction with uneconomical oil rates, limits the producing life.

In water-drive reservoirs the producing rates are often restricted during a large part of the producing life and therefore do not exhibit a definite decline pattern until later in the life of the property. If a water drive is very active, the total fluid (oil and water) produced might remain essentially constant throughout the life of the operation with the oil decreasing as the water increases toward the economic limit.

In many instances the rate at which the water increases is sufficiently uniform to permit establishing graphical relationships between oil and water production that can be extrapolated to economic limits and thus indicate oil recoveries. In this case, excessive water limits the producing life of the reservoir.

In actual practice the production performance of a particular reservoir reflects not only the physical characteristics of the reservoir and the energy source, but also a host of operational factors. These include weather, completion and recompletion effectiveness, production equipment selection, and economic conditions such as proration allowables, strikes and labor difficulties, and marketability of the crude oil.

Reserves Analysis

The foregoing shows in a simplified manner how the evaluation engineer develops background information necessary before answering the questions: How many gross barrels of oil will be recovered? At what rates can the oil be recovered? How long will it take to recover the oil? To illustrate how these questions are finally answered, it is assumed that a hypothetical oil field has just been developed in the Denver-Julesburg basin. A detailed examination of the reservoir reveals the physical characteristics shown below:

Type of oil accumulation . . . Stratigraphic trap (predominantly).

Reservoir rock characteristics . . . Porosity—21.2 per cent, permeability—500 md., connate-water saturation—22 per cent of pore space.

Definition of oil reservoir limits . . . Area—1,200 acres (based on structure contour map), thickness—10 ft. (based on isopach contour map).

Characteristics of reservoir fluid . . . Solution gas-oil ratio—600 cu. ft. per barrel, viscosity — 1.0 c.p., formation volume (shrinkage factor—1.3 bbl. reservoir oil per barrel of tank oil (bottom-hole-sample analysis).

Energy mechanism and efficiency of recovery . . . Energy mechanism—solution-gas drive, recovery efficiency—25 per cent of stock-tank oil in place, based on permeability, porosity, solution gas-oil ratio, fluid viscosity, and comparative analysis of similar oil accumulations.

Inasmuch as there is little production history available, these data are used to make initial volumetric calculations as follows:

Step 1: Barrels of Stock-Tank oil in 1 Acre-Ft. of Reservoir = (Barrels of Volume in 1 Acre-Ft. (Porosity) Pore-Space Available to Oil Formation Volume Factor

$$= \frac{7758 \times 0.212 \times (1-0.22)}{1.3} = 987$$

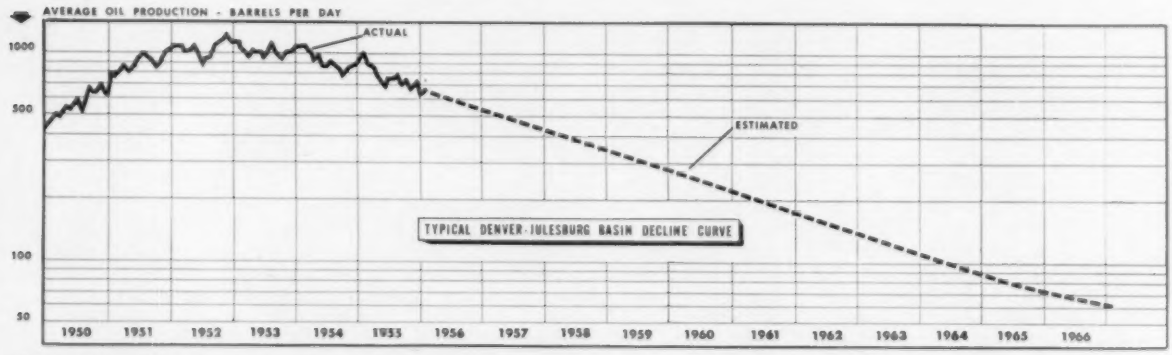
Step 2: Barrels of Stock Tank-Oil in the Reservoir = Results of Step 1 (Thickness) (Area)

$$= 987 \times 10 \times 1,200 = 11,844,000$$

Step 3: Barrels of Stock-Tank Oil Recoverable = (Results of Step 2) (Recovery Efficiency)

$$= 11,844,000 \times 0.25 = 2,961,000$$

Volumetric reserve estimates in new reservoirs often leave much to be desired from the standpoint of precision. Such estimates are subject to considerable margin of error. They are often revised as more production and pressure history become available and as operating policies become known.



FUTURE RECOVERY may be estimated by extrapolating a decline curve after a trend is established. This curve is typical for Denver-Julesburg basin pools. Fig. 9.

ELEMENTS OF FIELD PROCESSING—26

Sizing of Relief Equipment

by Dr. John M. Campbell

THE capacity of any relief device is dependent on the following major variables: (1) Orifice opening, (2) specific gravity of fluid, (3) temperature of inlet gas, (4) compressibility factor, (5) a nozzle coefficient, (6) absolute flowing pressure (including allowable overpressure), and (7) back pressure on the relief device. The following equations are therefore proposed by the A.S.M.E. and A.P.I. for calculating the necessary opening for a relief valve:

Vapors:

$$A = \frac{Q_v (STZ)^{1/2}}{1.175\ V_f\ C_1\ P_1} \qquad (1)$$

Liquids:

$$A = \frac{Q_L (S)^{1/2}}{27.2\ L_f\ (P)^{1/2}} \qquad (2)$$

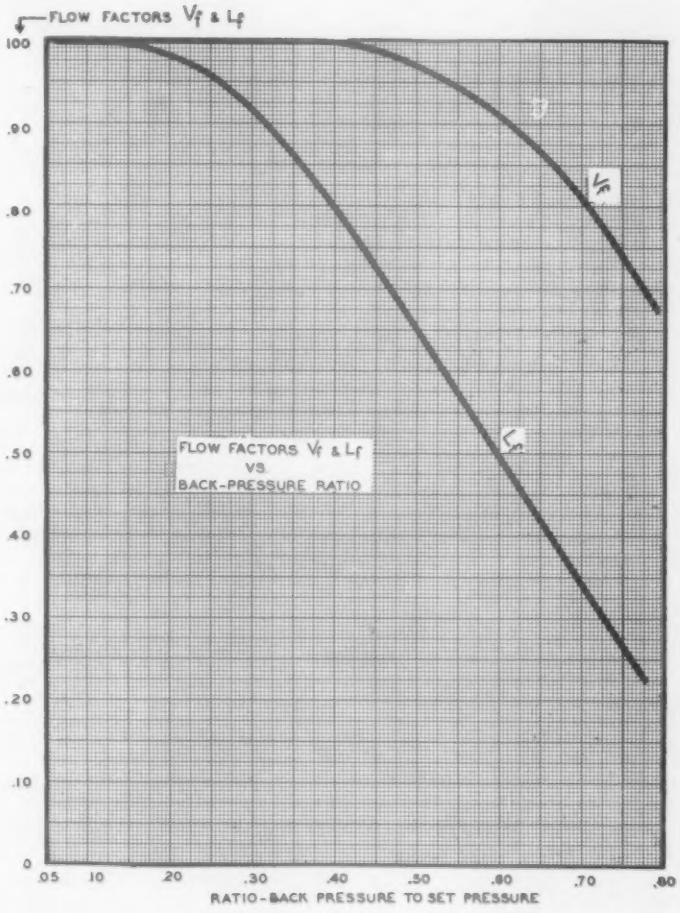
Where:

- A = orifice area, sq. in.
- Q_v = gas capacity, s.c.f. per minute
- Q_L = liquid capacity, g.p.m.
- S = specific gravity of fluid, dimensionless
- P = differential pressure (set pressure − back pressure)
- P_1 = flowing pressure (set pressure + allowable overpressure and barometric pressure), psia.
- T = inlet temperature, °R.
- Z = compressibility factor, dimensionless

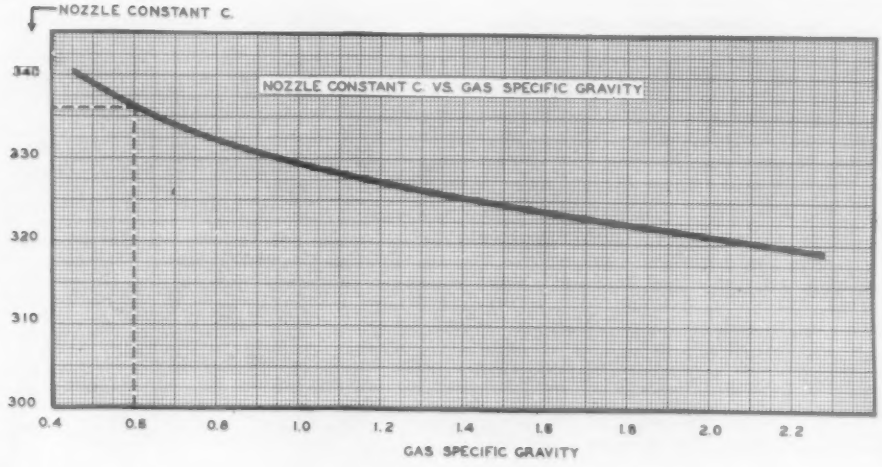
Author is chairman, School of Petroleum Engineering, University of Oklahoma, Norman.

This Series to Date

Dr. Campbell's series began on March 14, 1955. The first seven articles dealt with oil and gas separation. The next six articles concerned cleaning of gas. Starting June 14, 1956, and concluding here, 13 additional articles have described control of field processing equipment.



FLOW FACTORS for vessels with a working pressure greater than 100 psig. Fig. 2.



NOZZLE CONSTANT, C, is a function of nozzle-flow coefficient and gas specific gravity. Here, nozzle-flow coefficient is taken as 0.975. Fig. 1.

C_1 = nozzle coefficient, consistent units
V_f = gas flow factor, dimensionless
L_f = liquid flow factor, dimensionless

The nozzle-flow factor C_1 is obtained by combining the gas constant shown in the A.P.I.-A.S.M.E. and A.S.M.E. codes with the nozzle-flow coefficient of the specific valve. This coefficient is a function of the ratio of specific heats of the gas (C_p/C_v) which in turn may be correlated against specific gravity. Fig. 1 was prepared using this relationship and a nozzle-flow coefficient of 97.5 per cent.

Where the back pressure is less than 20 per cent of the set pressure, V_f and L_f may be considered equal to one. Above this pressure ratio only a bellows type of valve should be used (see Part 25). Fig. 2 summarizes the values of V_f and L_f for vessels with a working pressure greater than 100 psig.

With these figures plus knowledge of the other variables in Equations 1 and 2, a value for "A" is readily obtained. The orifice sizes for a valve are designated by the letters shown in Table 1. The valve chosen therefore should have an orifice letter corresponding to the next larger orifice area than the one calculated.

In choosing a specific valve it is further necessary to consider the pressure rating of the body and the inlet and outlet flanges, the inlet temperature, materials of construction, and any special limitations such as back pressure, etc. These will be outlined in the manufacturer's catalog. In some cases convenient nomographic solutions of Equations 1 and 2 are also available.

Example: A relief valve is to be installed on a gas separator that has a working pressure of 500 psig. at 100° F. If the vessel has a capacity of 10 M.M.c.f. per day of 0.60-sp. gr. gas, determine the proper orifice designation for the relief valve. The back pressure on the vent system is negligible.

Solution:

$$Q_v = \frac{10 \times 10^6}{(24)\,(60)} = 6{,}940 \text{ s.c.f.}$$

per minute

$$V_f = 1,\ C_1 = 336 \text{ (Fig. 1)},$$

$$T = 560° \text{ R.}$$

$$P_1 = 500 + 14.7 + (0.10)\,(500)$$

$$= 564.7 \text{ psia.}$$

From established specific gravity correlations, $Z = 0.93$.

From Equation 1:

TABLE 1—NOZZLE ORIFICE AREAS

Orifice designation	Orifice area (sq. in.)
D	0.110
E	0.196
F	0.307
G	0.503
H	0.785
J	1.287
K	1.838
L	2.853
M	3.60
N	4.34
P	6.38
Q	11.05
R or S	16.00
T	26.00

$$A = \frac{(6{,}940)\ [(0.6)\ (560)\ (0.93)]^{1/2}}{(1.175)\ (1.0)\ (336)\ (564.7)}$$

$$= 0.55 \text{ sq. in.}$$

Therefore the valve designated should have an H orifice (Table 1) since this has the smallest area satisfying the above result.

The above type of relationship may be used to calculate the flow capacity of a rupture disk since it also involves a modified orifice relationship. The coefficient, however, would depend on the fracture pattern established by the disk when rupturing and the degree to which the remaining metal hindered flow. For these reasons manufacturers' curves should be consulted.

BOOKS

The following books devoted to management, supervision, and automation are available from the American Management Association, 330 West Forty-Second Street, New York 18. These references represent up-to-date compilations by authoritative leaders and experts. Description of the individual books follows:

FOREMAN'S BASIC READING KIT. 213 pp., fabricated cover, $3.50.

The material in this booklet was especially designed to reach management's supervisory executives. Nineteen chapters discuss suggestions useful and helpful for foremen who have desire to succeed as managers and wish to develop their own personal resources. Discussions include: Foreman's Role in Management, Management the Simple Way, Understanding People in Work Relationships, Training in the Skill of Leadership, How to Improve Morale and Increase Production, Helping the Worried Worker, The Foreman's Part in Preventing Absenteeism, Constructive Discipline in Industry, Foreman's Discipline Check List. The Foreman's Balance Sheet, A Supervisory Review Plan, Supervision of Apprentices, Principles or Factors in Organization.

CAPITAL EQUIPMENT REPLACEMENT. 94 pp., paper back, $3.75.

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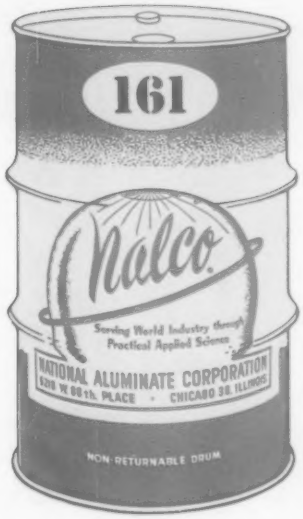

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MARSH PIPELINE CONSTRUCTION technique is shown with multiple 120-ft. barges laying 20-in. on Gulf Coast.

A Look at Submarine Pipelining

There are four types—and each has its headaches

by Claude F. Horton
Pipeline Consultant, Houston

THERE are four main classifications of submarine pipeline construction which will be examined in this paper. They are:

. . . **Offshore pipelining** in the open Gulf of Mexico.

. . . **Open lakes and bays** which are protected.

. . . **Previously dug canals** in marsh, swamp, or very shallow lakes and bays.

. . . **Previously dug trenches.**

Each has its problems and peculiarities, but it would be well to consider first the one feature that is common to all classifications. That is the problem of the weight coating of the pipe.

Weight Coating

My experience has convinced me that any and all submarine pipelines of a diameter in excess of 6 in. should have a concrete coating over the protective coating. There are several methods and products that are satisfactory and one new one (extrusion coating) which has just been used for the first time *(The Oil and Gas Journal, December 10, page 114).*

My experience has proved that concrete of the proper thickness, adequately reinforced and applied by the impact method, is very satisfactory. There has been considerable controversy and no little concern over the fact that concrete will not withstand flexure of the pipe without developing cracks. While this is indisputable, it is also true that with proper handling and reasonable care, the severity of this condition can be controlled.

After observing and experimenting on miles of lines of varying diameters, it seems to me that this is not cause for much alarm, and I am convinced that the cracks seldom extend all the way through the concrete. Neither have I seen evidence that this cracking has damaged the protective coating. At the inception of this method of applying weight it was considered simply as an improvement on river weights, an effort to obtain the desired negative buoyancy by a method that permitted easier handling of the pipe and proper placement of weight. It quickly became evident that this method could be made to serve a dual purpose.

The process has been improved and developed to the extent that it is now considered the answer to the problem of damaging marine life as well as the best possible approach to controlling buoyancy. The service life of pipelines in waters infested by marine borers has been lengthened materially by an application of concrete (yard applied) over the protective coating and a concrete field mold covering the joint made by the field welding of the pipe.

Field mold . . . There has been much discussion and considerable difference of opinion as to the value of the field mold on our submarine pipelines. In the absence of marine borers it loses

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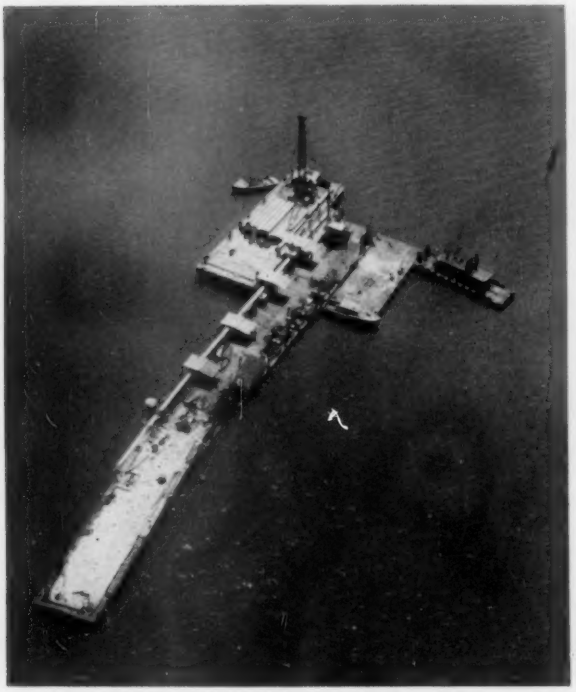

OPEN LAKE construction features multiple-barge-lay operation.

PIPE IS BEING laid in canal through wooded swamp.

some of its utility, but it does pretty well take care of the barnacle problem at the joint.

Another consideration is protection of the protective coating on the line during any jettying operations that may be contemplated. As jettying is the most economical and practical way of burying lines laid in the gulf, I feel that we are justified and will receive ample value from concrete field molds on all offshore pipelines.

It further seems justifiable to employ the field mold in all bays and lakes that have salt water and barnacles whether the lines are laid in a previously prepared ditch or are jetted down. Where lines are laid in reasonably fresh water and in a previously prepared trench, I question the justification for the expense of applying a concrete field mold over the joint.

Medium studies . . . When discussing the weighting of submarine pipelines, we consider specific gravity or negative buoyancy, but my observations have shown that many times the negative buoyancy has been calculated without proper knowledge of the weight and action of the medium in which the line is to rest. The maximum weight, under agitation, of the mud, sea bottom, or material on which the pipe is to be laid often has exceeded the value which it had been given. And the result is a floating line or one which will not stay down.

Some interesting studies have been made of these conditions which indicate that all obtainable data should be utilized in your calculations. Texas A. & M. College made a study of the bottom of the Gulf of Mexico off Louisiana. Pyburn & Odom, consulting engineers, made a study and prepared a good report for United Gas Pipe Line Co. on the floating and very unstable marsh in South Louisiana as well as most of the rivers that were crossed by the lines the company had built in 1952 and 1953.

Sinking problems . . . The gulf bottom embraces a variety of conditions, and all of them might conceivably be encountered in the laying of a single line. There are areas in the gulf that have a soft, soupy, and very unstable bottom in which a line, if too heavily weighted, may continue to sink until it is put in tension to a dangerous degree.

I recall one line I laid in the gulf several years ago that was weighted to a 1.4 sp. gr. in sea water and when filled with water for the hydrostatic test increased to about 2.0. In one area of several miles width which we crossed, we had difficulty in finding the line to bury it. Our divers with probing bars finally did locate it, and in some places it had sunk 14 ft. below the mud bottom. One must conclude then that the entire route of the proposed offshore line should be sampled and studied with the idea of design in weight to fit the conditions that exist where the line is to be placed.

This problem is not as serious in the shallow bays and lakes. To be sure, it is well to know the conditions, but the extremes are less likely to occur and the remedy is not nearly so costly or hazardous should they occur. The marsh in South Louisiana can vary fully as radically as the gulf bottom, but there again the access as well as vegetation minimizes the problem. And, generally speaking, underweighting has been noticeable in the past, while I personally do not know of any difficulties experienced from overweighting. Swamp ditch does not present this problem except in rare cases as trees are reluctant to grow in the rotten marsh, and generally the bottom of the canal or trench in the swamp is quite stable.

THE AUTHOR

Claude F. Horton, a graduate of Massachusetts Institute of Technology in engineering administration, was born in Dallas, the third generation of a family engaged in the construction business. He has been engaged actively in the construction field since 1930. He was a vice president of Brown & Root, Inc., in charge of all pipeline construction, until 1955 when he resigned to form his own company. A registered professional engineer in Texas and a member of the A.S.C.E., Horton is presently doing consulting work in Houston.

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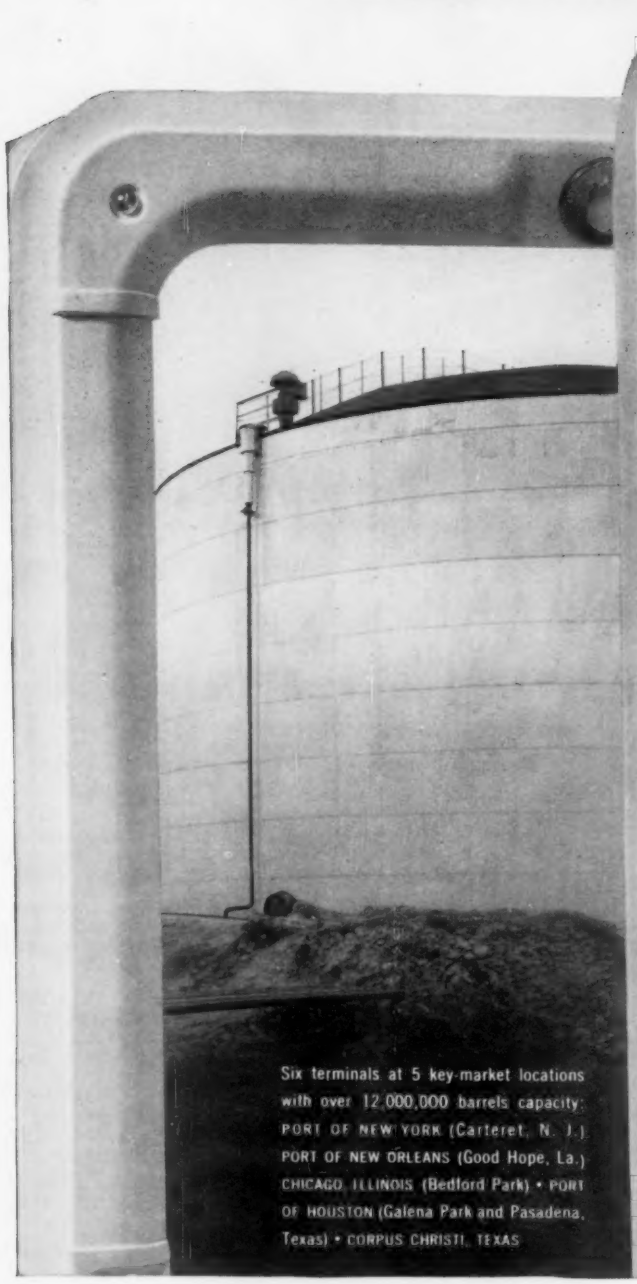

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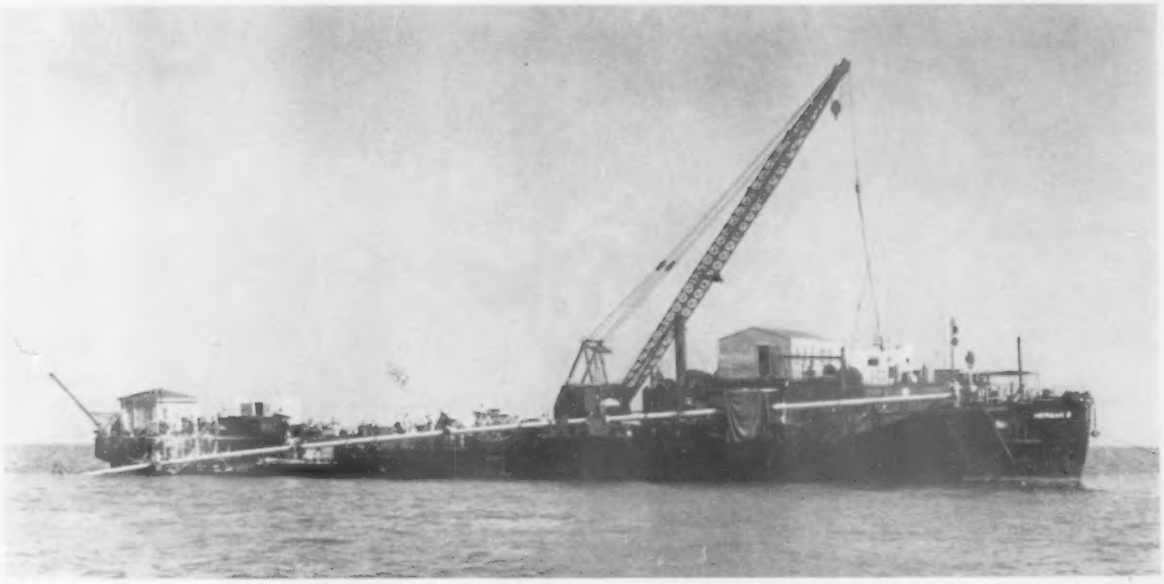


OFFSHORE LINE 12-in. in diameter is laid from ramp on side of barge.

The problems of protective coating of pipelines is outside the scope of this discussion. But concrete may be very satisfactorily applied over several different protective coatings.

Offshore Pipelining

In examining submarine pipelining, consider first the offshore pipeline; that is, a line laid in the open gulf where the operation is subjected to all the hazards of unprotected waters. Three distinct methods have been used, and they can be labeled in this manner:

. . . Floating out, by means of buoys, previously welded strings of pipe and joining them together above water, then releasing the buoys to permit the pipe to sink to its final position on the bottom. This method is too costly and too hazardous, and it subjects the pipe to unreasonable punishment and possible damage. I know of no one in this country using this method now.

. . . The Collins method. This method consists of welding and completing all operations on the pipe in long strings, attaching sufficient buoys to the line to control its buoyancy so that it drags bottom just enough to keep it on line, and pulling it out by means of a pulling unit mounted on a barge. I have seen it used successfully on a 20-in. crossing of the Mississippi River. Collins has published considerable literature about his method.

. . . The third method is the method currently being employed most generally and is the one which I played some small part in helping to develop and perfect to its present standing. This method, stovepiping, consists of stovepiping the pipeline on a barge which is seaworthy and of sufficient size and length to permit employing the proper number of "positions" or "stations" to allow the pipe to be processed completely as rapidly as it can be welded.

The operation, which we may term the "assembly line," takes place on a ramp usually constructed on the side of the barge. The shoes or rollers which support the pipeline as it is being processed are solidly welded to members through the side of the barge. They are located on approximately 40-ft. centers and on a vertical curve. Each roller or shoe has within its base sufficient vertical adjustment to set that point, through rather a wide range, on that curve which will permit the pipeline to enter the water in a manner calculated to keep the stresses in the pipe and the cracks in the concrete to a safe, allowable tolerance.

The barge is usually equipped with nine 5,000-lb. anchors attached to long lines controlled by hoists. The barge is moved ahead and positioned by means of these anchors, and the anchors are moved ahead by a tug whose sole mission is to handle this part of the operation.

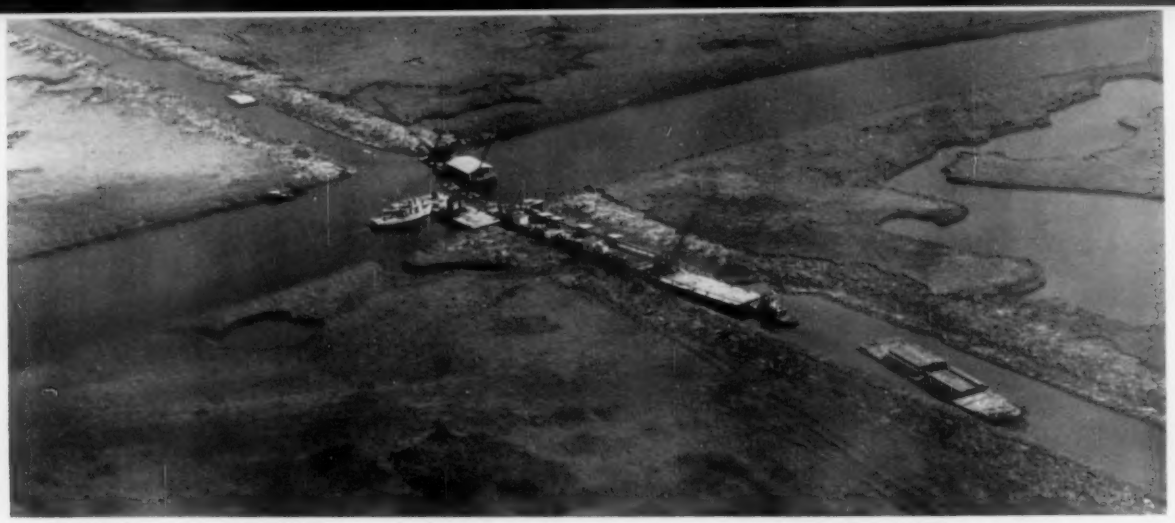
We have found that the curve I mentioned can be controlled satisfactorily in water depths up to 25 or 30 ft. without any additional support for the pipe between the last roller position, which is slightly above the water surface, and the gulf bottom. In depths of water from 25 to 40 ft., we employ a cradle suspended from a gantry boom which reaches out over the stern end of the barge.

Controlling negative buoyancy . . . In water depths in excess of 40 to 50 ft., depending on the diameter and wall thickness of the pipe, the negative buoyancy of the line may be controlled by attaching buoys to the pipe at calculated intervals so that the pipeline will take the curve desired between the last support and the gulf bottom.

After the pipeline has reached the final position on the bottom, the buoys are detached by means of a latch that is tripped by pulling on a cord or line running from this latch up to the surface where it is attached to a small buoy or float. The pipeline buoy is then brought back to the barge where it may be attached again.

In the event of a blow or very rough seas, the buoys may be attached right up to the end of the line, the line capped, and the barge moved out from under the pipeline and off to a position where it can swing on its anchor. After the seas have subsided, the barge may be moved back to position, the line picked up and placed back on the ramp, and laying operations resumed.

Problems . . . One might conclude then that theoretically pipelines may be satisfactorily constructed by this method in any depths of water without limit. It certainly appears reasonable to assume that lines may be satisfactorily laid in any depths in which it will be feasible to drill. But the picture can quickly become complicated by the admission of crosscurrents and the thrust and stresses they will exert on that portion of the line between the bottom and the last support position on the barge. This, too, may be overcome by one of several means, the most effi-



CROSSING IS LAID in marsh by merely sagging line without break in pipe laying.

cient and satisfactory depending on the particular conditions existing in the case involved.

It is evident that many pipelines in the future must be constructed in water depths far exceeding any that have been encountered heretofore, and it seems inevitable that costs will increase as the water depth increases. The problems to be faced and met are not all known nor recognized at this time but will inject themselves into the picture as we go farther offshore with pipelines.

Higher barge costs? . . . There is one situation which in itself may and will, as it now stands, increase costs materially over those costs experienced to date. The Coast Guard has ruled that no barge or craft will be approved for operation in the Gulf of Mexico that does not meet the A.B.S. length-to-depth ratio requirement of 16:1 and whose plans and design have not been approved for seaworthiness.

This means that, with few exceptions —and I actually can recall only two— the barges or craft that have laid all the lines in the Gulf of Mexico are no longer acceptable to the Coast Guard. As a cost comparison let me cite the fact that the most efficient lay barge I have yet seen used was a standard conversion of the L.S.T., which results in a barge some 50 ft. by 250 ft. by 12 ft. and which fails by some 4 ft. of depth to meet A.B.S. requirements.

These barges were acquired at a cost of $50,000-$100,000. To build a barge of sufficient length and width and depth to meet all the new requirements and be comparable to the old L.S.T. conversion in efficiency will today require several months and will cost approximately $400,000. Such an investment in specialized equipment that can be used only approximately half the time is rather discouraging and cannot help but materially increase costs. It may be possible to circumvent this ruling by special interpretation for pipe-laying barges, but at this time the ruling stands as stated.

There has been some consideration given to the use of the big work barges which operate on platform work offshore as converted pipe-laying barges. This has the advantage of double utility, but I seriously question the economy of such an operation. The barge will be unwieldly, will require larger anchors, larger tugs, and generally a more costly operation in every particular, while it seems most unlikely that the progress will be comparable to that which one might expect from the proper size lay rig.

Weather hazard . . . Offshore pipelining is an operation in which weather plays a major role. It has generally been considered impractical and too costly to attempt to work full spreads or attempt major offshore pipeline construction between October 31 and May 1.

As lines are laid farther offshore and in deeper water, this weather hazard becomes even more to be reckoned with. As we move farther offshore and into deeper water, the seas run higher, and larger tugs and equipment become necessary. The problem of transfer of personnel, materials, supplies, and pipe becomes acute, and the hazard is ever present even though the anchors may hold the lay barge practically stationary.

As the depth of water increases and that portion of line between the surface and the bottom grows longer, the tendency for this section to oscillate or move slowly up and down increases. This causes the pipe to travel slowly backward and forward on the rollers or "saw" in the shoes. This is not too objectionable within limits. I only wish to call attention to facts, all of which indicate that the cost of constructing offshore pipelines must materially increase as we move farther out and into deeper water.

I also am aware that this is a "blue chip" industry. And while costs of laying the underwater pipelines may go to very substantial figures, the alternatives will be equally affected and the pipelines well justified.

Burying offshore pipelines . . . Let us examine now the problem of burying offshore pipelines. This subject has been quite controversial among the pipeline companies. The U. S. Engineers require that all lines be buried out to the minus 15-ft. contour, but past that it has been done at the option of the company. The principal arguments in favor of burying pipelines offshore have been that it affords protection against:

. . . Shifting sands on the bottom.

. . . Barnacles.

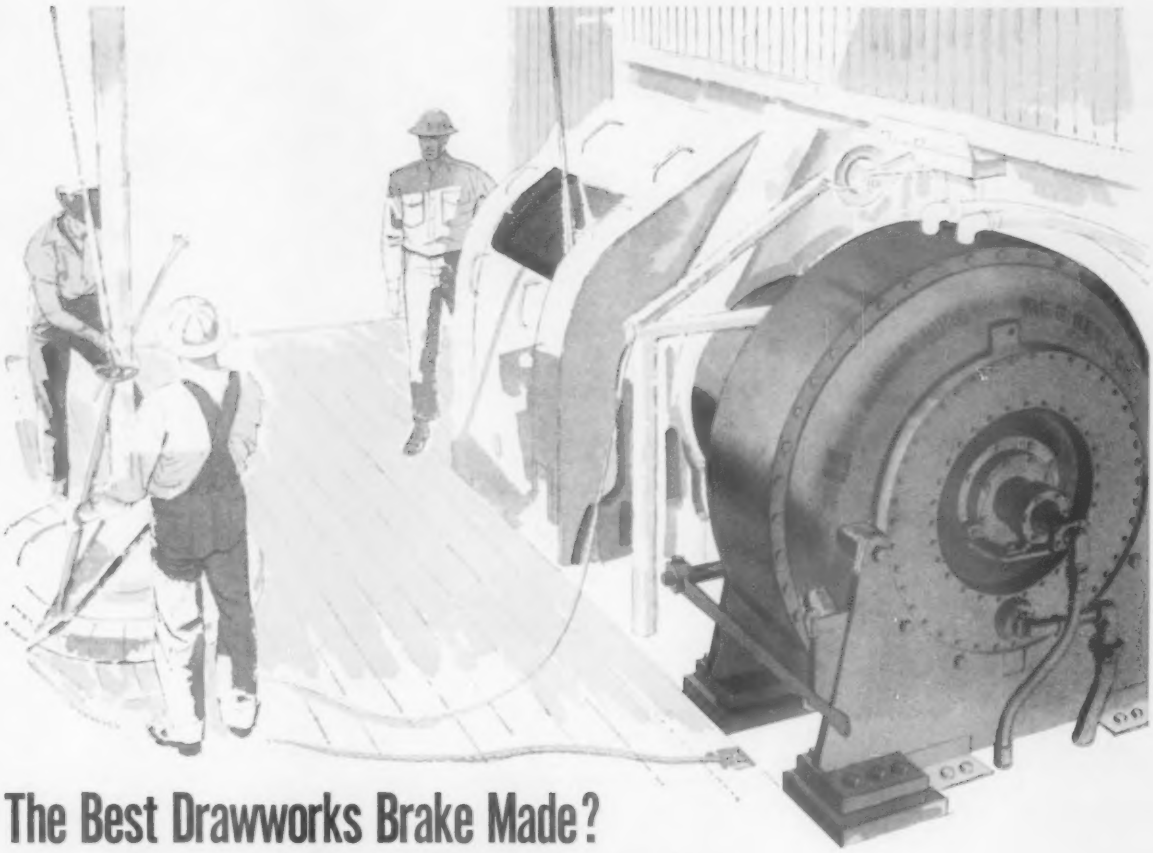
. . . Damage to the nets of fishing boats.

. . . A dragging anchor.

The first three arguments are well founded, as burying the line usually affords this protection. However, the economic justification may be open to attack, and I expect that the costs which will be experienced in burying lines in the deep water may greatly dampen much of the enthusiasm for this operation. The protection afforded against a dragging anchor is rather doubtful, as any large ship's anchor would dig into the bottom to a depth probably reaching the pipeline.

The most popular method of burying offshore pipelines is the use of jetting equipment.

A cage or frame is constructed of pipe with jets set at the desired angles. This frame fits over the line and a mixture of water and air in large volumes and at high pressures is forced through the jets. This extreme agitation and cutting power actually blasts



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out the materials under the pipeline and as it moves forward along the line, the pipe settles into the depression left.

Another very good method utilizes water only at large volume and high pressure, and a dual suction head alongside the pipe and on each side actually removes the spoil and leaves a trench which the pipe settles into. Both methods work well in a fairly firm material or a mud bottom. However, the pure sand bottom fills in quickly, and the burying operation is slow and requires multiple passes with the jets. The problems and progress will be materially affected by deeper water, and the cost will increase accordingly.

Open Lakes and Bays

At this point the pipeline is on shore. You may next be faced with the problem requiring utilization of Classification II. This is where the pipeline must cross open lakes and bays that are actually open but protected waters. Their depth seldom exceeds 12 ft. but is always sufficient to float equipment.

Method . . . The method generally accepted as the most practical and economical for this type of work embraces the use of multiple standard inland-water barges. They are hinged together at the ends and equipped with spuds for holding the barges secure during the work cycle.

A ramp similar to that used on the offshore barge is used extending over the entire length and located about 5 ft. from one side. The same adjustable roller supports are employed and the proper curve of the pipeline more easily controlled.

The number of barges used is dictated by the economics of the individual project and considers the mobilization, the footage to be laid, and the diameter and wall thickness of the pipe used. For example, in laying up to 20-in. standard line pipe, two welding positions permit welding the pipe in approximately the same time required to dope and wrap a joint or to put on a field mold of concrete. We then employ two welding stations, one for priming and/or X-ray, one for doping and wrapping the joint, and one for applying the concrete field mold, and so require at least 220 ft., assuming 40-ft. joints.

Two standard barges 30 by 6 by 110 ft. serve admirably. Power hoists are mounted on the deck and are used to handle the spuds and to move the barges ahead after the work cycle is completed. This move is effected by using the completed or welded pipeline as a thrust anchor. The pipeline is buried either by trenching ahead with clamshell rigs or by jetting down as in the offshore operation. The choice of methods depends on such factors as stability of the bottom, the presence of oyster beds, and various factors peculiar to the particular location. This is a simple operation, a practical way to lay pipe, and the most economical I know of under the above described conditions.

Canals

Classification III embraces laying pipe in a previously dug canal whether in marsh, swamp, or very shallow lakes and bays. The pipe-laying operation is identical with that described in Classification II except that, of necessity, the pipe and supplies are handled generally from a barge in front of the operation instead of alongside the lead barge.

The canal is usually box cut some 30 to 35 ft. wide and to a depth of about minus 6 ft. mean gulf level unless special requirements necessitate a deeper cover. A pipe trench is dug on one quarter to allow the pipe to sink below the canal proper. The lay barge or unit lays ahead continuously with as few interruptions as possible. The method is ideal for visual inspection purposes, and stress control is easily practiced.

This method was employed on the first large project laid through the marsh for United Gas Pipe Line, and in most subsequent similar lines, with improvements being made constantly. Many property owners will not permit a canal so other methods must be used. But there are areas in the marshes that are so soft and unstable as to make this method necessary or rather to render any other known method impractical. In these areas the spoil from the canal disappears as it is deposited alongside the cut, and any ditch cut becomes in reality a canal.

Trenches

The last classification employs the method known as "shoving" pipe. The pipe is made up and stovepiped continuously from prepared ramps or stationary barges. Local conditions dictate the most economical ramp. Where feasible, the customary approach is one lay barge spudded down with the last two positions set up on mats on the ground. Buoys are attached behind the last position and the pipeline is continuously shoved down a previously prepared trench and floats on these buoys to its desired position.

This method is usually employed where right-of-way easements dictate or in those areas where the marsh is very firm and small draglines on marsh tracks or mats can prepare trench more economically than a canal can be cut. Where this condition exists and the property owner insists on backfill, this method becomes an economic must.

The shoves are made with as few moves as possible; and there is no theoretical limit to the length of shove that can be made if the pipe is floating and the ditch free from angles. But it is most unlikely in the marsh to get a shove of over 3 or 4 miles without encountering sharp angles that the pipe will not negotiate, or crossing navigable waterways. The problem of sinking the pipe and detaching and gathering up the buoys can sometimes be quite weighty.

The latter two methods or classifications are clearly closely akin and are often used consecutively. As a cost comparison, we could say that while the pipe can be laid perhaps generally more economically from barges, the cost of the ditch can be considerably less than the canal in areas where it is feasible to make ditch by other methods. Several ingenious methods have been used to prepare trench in the marsh, and several apparatuses have been developed that perform successfully in their proper medium. The method of making ditch successfully and economically depends on the condition of the marsh through which the ditch is to be cut.

I have made no mention of double or triple jointing of the pipe prior to the laying operation in any method. I have tried it and have seen it tried many times, but I have never been convinced that it was the economical thing to do.

Wooded Swamp

Consider briefly now the wooded swamp and its problems. The major problem here is ditch, and it can best be made by canal methods unless that is not feasible. The trees in the Louisiana swamps are mostly cypress. They grow to great size and have a stump that practically defies any but the heavier, more powerful machines.

Where it is impractical to dig a canal, the trees may be felled with stumps cut off short and a large dragline matted through. I have, on one occasion, dynamited a ditch by string shooting after felling the trees. It was rather an expensive operation, but we did actually complete a ditch for 20-in. pipe.

Here's a word of caution about cost estimating on lines to be laid in the wooded swamp. It will be well to remember that the cost of operation of laying the pipe will, except at the extremes, tend toward a direct ratio with the diameter of the line. But the cost of the trench bears but little relation to the diameter of the pipe. For example, of the total construction cost of laying pipe in a canal through wooded swamp, nearly half is represented by the canal and clearing. This cost will be practically the same for 8-in. or 24-in. pipe. **End.**

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Obviously this means a higher safety factor. For example, 10 lines of VHS have a safety factor about equivalent to 12 lines of Improved Plow Steel. Or, with 10 lines of VHS you get a safety factor 14.9% or 15% higher than with 10 lines of IPS.

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In addition to its greater strength VHS is tougher. It has greater resistance to abrasion and higher resistance to peening—both important factors in maintaining shape and diameter. Following regular, adaptable cut-off practices should result in ton-mile advantages.

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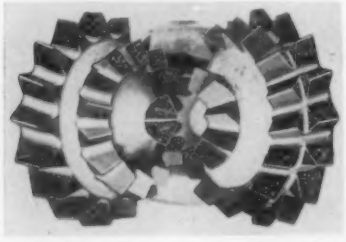
How Two-Cone Bits Are Designed

by H. G. Bentson
H. C. Smith Oil Tool Co.

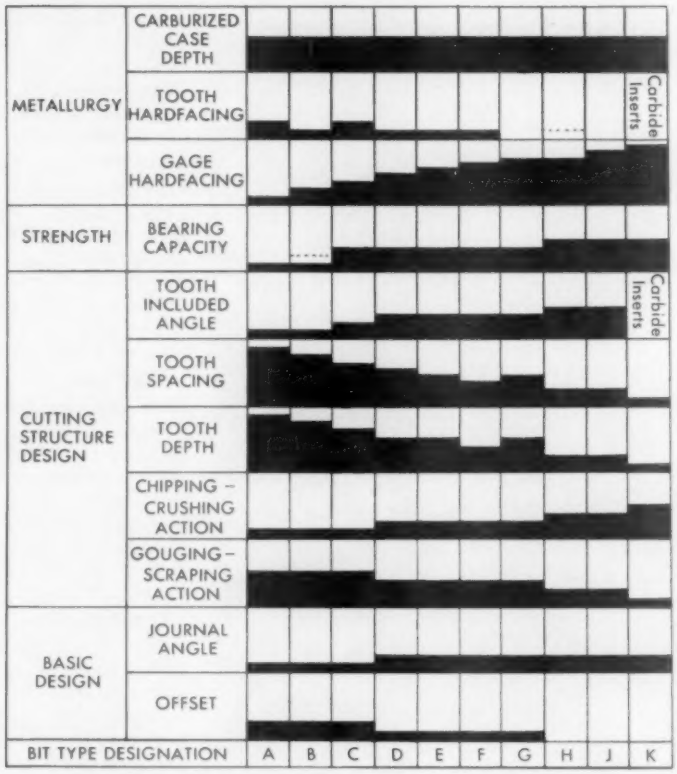
THE Type-A two-cone bit exemplified by Fig. 27 shows the general characteristics of this design. Although the values of offset, journal angle, and cone-profile angles may vary between different makes, these design factors are adjusted in each to obtain the maximum gouging-scraping action required for the soft formations.

Teeth are slender, deep, and widely spaced, and are faced for optimum tooth life and gage protection. As in the three-cone and cross-section designs for the A type of bit, bearing capacity is minimum to provide maximum tooth depth. The bottom-hole pattern, also shown in Fig. 27, indicates the gouging-scraping effect generated by this design.

TYPICAL TYPE A two-cone bit and bottom-hole pattern. Fig. 27.



TYPICAL TYPE C Two-cone bit. Fig. 28.



THREE-CONE rock-bit design factor comparison by bit type. Fig. 29.

A. Variation in column height for different bit types denotes a difference in the design factor.

B. When comparing two or more types having varying column heights, the type represented by the highest column has the greater design factor.

C. No variation exists in the design factor of the types when the column heights are the same.

D. Where column height is indicated by a dotted line, two possibilities exist within the general type classification.

E. Where column height is zero, design factor is also zero.

F. Neither the column height nor the ratio of increase or decrease in column height should be construed in any way as being a quantitative value.

The C type of two-cone bit shown in Fig. 28 is designed for drilling soft-to-medium formations interspersed with hard streaks. Inasmuch as the drilling requirements of this design are similar to those for the same three-cone type of bit, it should be apparent that the design factors must be applied in a like manner.

Consequently, the gouging-scraping characteristics of the C type of two-cone bit approximate those for the A type of bit. However, the teeth are more closely spaced, heavier, and shallower for more rapid penetration of the harder streaks.

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1 Pipe is buried in concrete with half a hinged welding clamp attached.

2 A long joint of pipe, in horizontal position, is then secured to the welding clamp.

3 The joint is pulled into an upright position and welded to the base.

Pan-Am Southern saves time as . . .

Hinged bracket supports 6-in. stanchions

IN a plant-improvement program, relocation of pipelines on overhead stanchions required the installation of many of the stanchions in confined areas. Vertical stanchion supports consisted of 6-in. pipe lengths, which had to be set in concrete to form secure bases. Handling of these heavy joints posed a problem.

This problem was solved by means of a hinged bracket and on-the-job ingenuity at Pan-Am Southern Corp.'s El Dorado, Ark. plant.

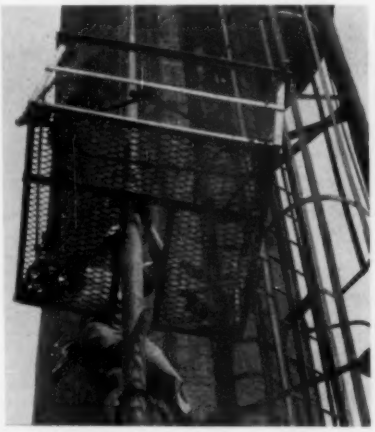
Short lengths of 6-in. pipe were seated in concrete with about 1 ft. extending above ground level. Two 6-ft. pipe welding clamps were hinged together and one was secured around the seated pipe. A long joint was then fastened in the other clamp which was hinged. This was accomplished while the joint remained horizontal and on the ground. Once secured in the clamp, it was simple to raise the joint to a vertical position. Then the joint was welded in place to the short section imbedded in concrete.

The clamps were then removed.

Portable elevator makes rugged flying scaffold

A FLYING scaffold saved time and money on a repair project involving six towers on one unit at Pan-Am Southern Corp.'s El Dorado, Ark., refinery.

Repair crews were faced with the job of installing 19 valves weighing from 80 to 250 lb. These had to be installed in elevated locations, some as high as 60 ft. from the ground. The conventional approach would have meant a tedious expensive job of erecting scaffolding on the six individual towers.



FLYING SCAFFOLD is made of slotted base and railings on three sides.

CHAINS are used to ground the scaffold at any desired height.

Working platform . . . Welder Curtis Andrews, Rigger Leaderman Lloyd Burgess, and Bob Wright, general foreman, came up with the idea of the flying scaffold. This was simply a working platform made of heavy steel grating with angle-iron railings on three sides.

The fourth side was left open for working space. Additionally, a slot was left in the base which opened out to the fourth side. This slot straddled vertical piping on the towers; the scaffold could be moved close in to the tower itself.

The scaffold was raised and lowered

by a truck winch with the line running overhead through a tackle block down to the scaffold.

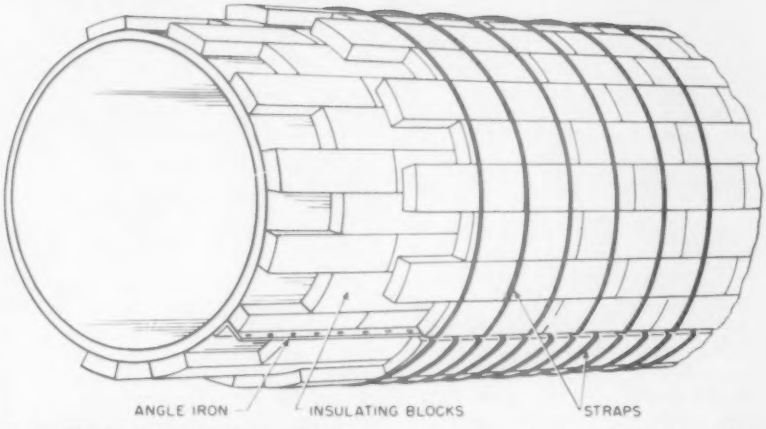
Valves, tools, and repair crews were elevated easily to the working height in this manner. Once in position, the scaffold was secured with chains to provide a safe, stable working platform.

The flying scaffold reduced the scaffolding job by an estimated 80 per cent over conventional methods.

Esso uses television

Television is now being used for the first time by Esso Research & Engineering Co. in pilot-plant operations at the firm's Bayway, N. J., facilities. The closed-circuit setup permits shift foremen to check safety of operators in a pilot-plant unit 300 ft. away in a separate building. Foremen would know instantly should trouble develop. Another receiver is in the shift inspector's office.

INSULATION BLOCKS are secured here with clips which can be cut off.



HORIZONTAL-TANK insulation affixed with metal straps anchored to angle irons. Blocks are mitered or pressed over angle irons.

How insulation is fastened to vessels

THE types of anchors and securements to be used when fastening insulation on the under and vertical sides of vessels depend on the equipment to be insulated and other conditions of construction or operation. In general, there are three types of anchors: continuous angle irons, spot anchors such as clips, hex nuts, etc., and welded studs or pins.

Continuous angle irons are employed most frequently on cylindrical vessels of large diameters. On horizontal tanks, for example, the angle irons are welded to the underside and spaced 120° apart, equally distant from the bottom center.

Metal bands . . . Insulation blocks are secured by metal bands affixed to holes previously drilled in the projecting angle iron. Six bands per 3-ft. insulating block are recommended for the lower third of the tank, and three bands per block for the rest of the circumference.

On large vertical vessels, angle irons are welded vertically at intervals, of approximately 20 ft. and insulating blocks are secured with bands in the same manner, three bands per block.

Depending on the height of the vessel, circumferential angle irons should be used for vertical support and placed at 12-ft. intervals.

In the case of vertical vessels with conical or convex ends, spot anchors are most desirable. Angle clips with holes punched in one leg or hex nuts are welded to the surface and spaced in a pattern of concentric rings. The anchors in each ring are equally spaced.

The blocks are held in place with wires secured to the anchors and tied across the face of the blocks. Hairpin wires may be drawn through the anchors and extended through the tightly butted joints of the blocks.

Tie wires can be secured with the hairpin wires and the latter can be used, also, to secure mesh wire where it is desired as a base for cement finishes.

Large breechings . . . The same method can be employed on the flat underside of large breechings. Flat vertical surfaces require anchors only on 24-in. centers.

Using Electronic Computers in the Oil Industry

Block Diagram Acts as Problem Flow Chart

by O. D. Ferris
Datics Corp.

ONE of the preliminary steps in preparing a problem for machine solution is to draw a block diagram. This diagram is a plan of the procedure which the computer must follow in order to solve the problem. It includes provisions for every decision which must be made, and the resulting courses of action. In short, it is a simplified layout of the problem, showing the sequence of operations.

To be really very useful, a block diagram should be drawn before the program of machine instructions is written. Perhaps this seems elementary, but all too often it is constructed as an afterthought. In this latter case, the diagram is helpful only in making changes, or in familiarizing someone else with the problem.

This diagram is also referred to as a flow chart. It indicates the flow of information from the raw data at the beginning to the finished answers coming out of the system. When properly prepared, it serves as an outline or plan of attack which is very useful in breaking the problem down into detailed steps. It helps the programer to coordinate the various sections of a complex problem so that they will mesh together in a reasonable manner. It tends to increase the efficiency of the final program for the computing machine by keeping the over-all picture before the programer. It is extremely valuable in helping others to understand the machine code for the problem. It is a handy guide in case it becomes necessary to change the program later.

Block diagrams vary considerably in the amount of detail shown, depending upon the type of problem and the philosophy of the programer. One technique is to construct a broad general flow chart of the entire problem, followed by a series of detailed block diagrams covering various sections. The example chosen here as an illustration is in considerable detail. It represents the problem of computing a table of square roots (to six decimal places) of the numbers from 1 through 99. The method used to obtain square roots is the following:

Assume:

$$(N)^{1/2} = x$$

The actual square root lies between x and N/x. Therefore, take as a next approximation the average of x and N/x:

$$y = 1/2\,(x + N/x)$$

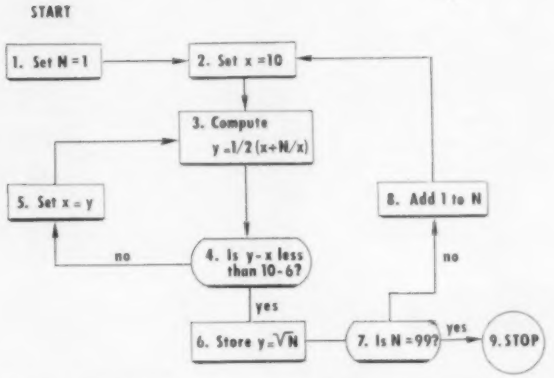
This process is repeated, calculating new approximations until the change in x is too small to be of interest. In this example the computer always starts with $x = 10$ and iterates until the change in x is zero to six decimal places.

In Block 1, the computer selects the first value of N for which it is to compute the square root. In Block 2, the square root is assumed to be 10 regardless of which value of N is being considered. Notice that in Block 3, the iterative program rapidly reduces the assumed value to the square root of 1. The new assumed value is calculated to be $1/2\,(10 + 1/10) = 5.05$.

Block 4 is drawn in an oval fashion to indicate that a decision is to be made here. If the tolerance is not satisfied, the program recycles through Block 5 and repeats Block 3. If the tolerance is satisfied, the answer is stored (or printed) in Block 6. Block 7 is used by the computer to decide if all 99 answers have been computed.

Thus, we conclude that the block-diagraming operation is simply a formal organization of the work to be performed. At this point, the problem computation could be understood and performed by normal clerical help.

The next issue will start with block diagrams and illustrate the transition to actual machine language.



BLOCK DIAGRAM gives the computer a procedure plan. This example represents a problem of computing a table of square roots.

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by saving $50,000 per boiler cleaning?

Here's An Example Of Such A Savings
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Dowell recently chemically cleaned a 1,000,000 lb. per hour steam generator for one of its customers. Total outage time was 48 hours. This saved the company an estimated five to seven days down-time, as compared to mechanical cleaning methods.

Considering replacement power for a boiler of this capacity costs between $7,000 and $15,000 per day, it's easy to see a $50,000 savings. And, it's just as easy to project a $250,000 to $500,000 annual savings for a plant with five to ten such boilers.

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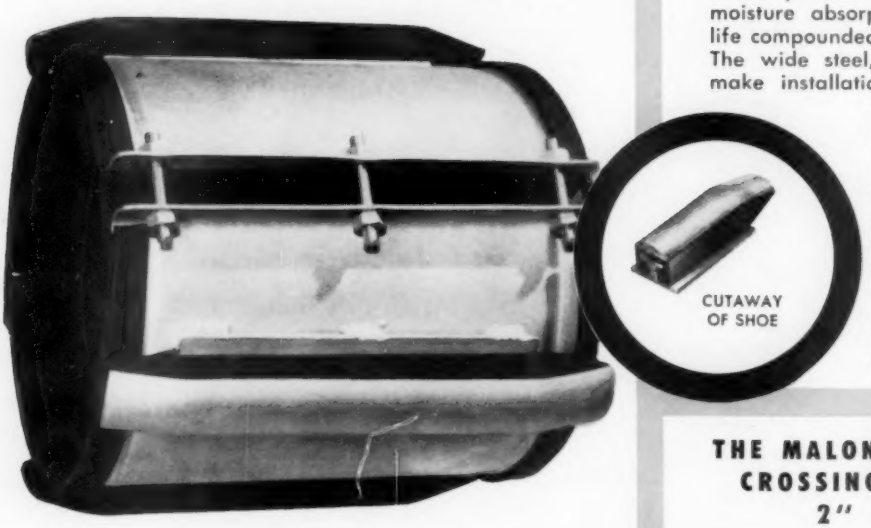
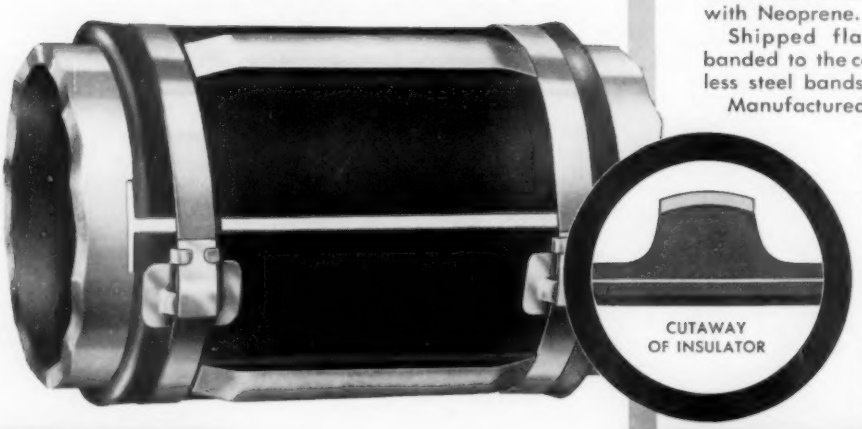


THE MALONEY MODEL 55 CROSSING INSULATOR FOR ALL SIZES OF PIPE

These insulators have superior insulation qualities because of the low moisture absorption and the long life compounded into the Neoprene. The wide steel, sled type runners make installation easy. The extra wide band affords a positive grip.

Bonded metal-to-Neoprene-to-metal, the runner insulates and also permits flexibility to compensate for pipe shifting and acts as a shock absorber to prevent damage due to sudden heavy loads.

or small



THE MALONEY MODEL 56 CROSSING INSULATOR 2" TO 12"

Manufactured with Neoprene, which is vulcanized to steel band core and to the rounded steel runners, there is no place to "short-out" between the casing and the carrier line. The steel core is completely surrounded with Neoprene.

Shipped flat, the Insulator is banded to the carrier pipe with stainless steel bands.

Manufactured in sizes from 2" thru 12", it can be used either on installations where there is only one nominal pipe size difference or on installations having a larger differential.

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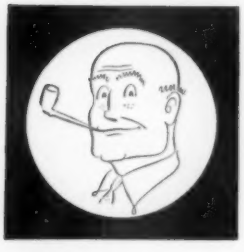

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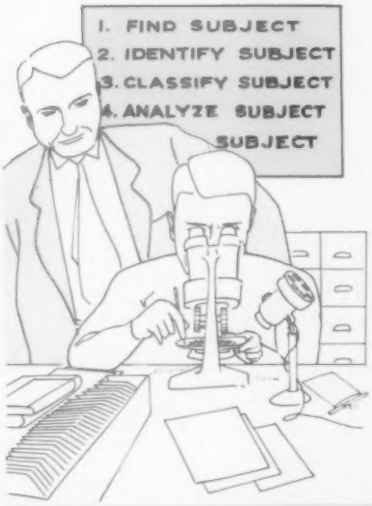
A 10-MINUTE JOURNAL FEATURE

Better Management

Determine knowledge and ability of trainee

Prepare job-analysis instruction chart



Instruct duties in chronological sequence

THERE is an ever-increasing demand for training on the job. This need is created by such occasions as the hiring of new employes, promotions and transfers, changes in manufacturing and production methods, and introduction of new products. Job instruction also is required from time to time to correct weaknesses in otherwise capable performance. A sizable portion of a manager's or supervisor's job involves instruction.

The supervisor who has not devoted some conscious thought and planning to the techniques of "how to instruct" is often an ineffective teacher.

Check through the following pitfalls, and note the corrections applicable to each:

☐ The instructor, as an experienced worker, may think of his work in bigger units than the new man can grasp readily. A good instructor knows how to break instructional units of information into the appropriate size for the learner.

☐ The instructor may neglect to teach the entire operation. As a person becomes more expert, some of the knowledge or habits he first learned become automatic or merge with other knowledge or habits. Not realizing this, he may teach only what he sees on the surface and not the submerged operations. He leaves out important connecting links, and fundamental information which he assumes the learner knows.

☐ The instructor may stress the things that seem important to him. He forgets some of the things which can make or break the operation when performed by a beginner.

☐ He may forget why a job is done a certain way. By failing to explain the reason why, he can make the job seem dry and uninteresting. This slows up the learning process.

☐ Because he is used to doing rather than teaching, the instructor may become impatient with a learner who fails to learn quickly.

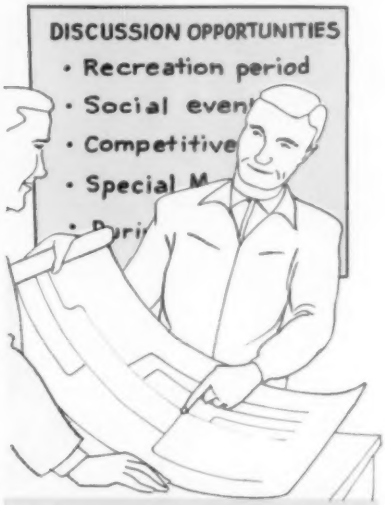
☐ He may not prepare himself properly before instructing. Consequently, when he starts instructing he may not have a clear idea of the exact number of steps in the operation he is teaching, or the features of each of the steps.

☐ The instructor may be deficient in a knowledge of human relations and hence may antagonize his learner.

TIPS ON TRAINEE

Explain completely steps and importance

Demonstrate right and wrong methods



Encourage questions from trainee

A good instructor knows how to gain the confidence, good will, and cooperation of the learner.

Preparation for Instruction

An organized training plan shows the manager how to spot an employe's immediate training needs, and how to schedule the training to meet these needs. This eliminates a lot of needless extras and directs all instruction to meet certain definite needs.

Here are some important steps in an instructional program:

1. Prepare a job breakdown. This shows the instructor how to pick out the important steps and key points in the development of fully competent personnel. Here is where he learns to select and stress those little knacks of the trade that the instructor knows so well he forgets to pass them on. Once these knacks are included in the planning, however, they enable the new employe to do the job right and reasonably fast.

2. Have everything ready. Be sure that you get the habit of having your materials, supplies, and equipment completely ready before you undertake to instruct an employe. Lack of preparation on your part will confuse the trainee and waste time.

3. Prepare the employe. Put him at ease. Prove by what you say and do that nothing is expected of him that he can't learn to do with reasonable effort, and that you are interested in only one thing—to help make his work easier and more effective.

Explain the job and its importance. When he sees his job in relation to the whole picture, he becomes much more interested in learning to do the job the right way.

Create interest. Don't take it for granted that a man is interested in what you want to teach him just because he gets paid for it.

4. Present the job—tell and show him. Follow your job breakdowns. Whenever you train a person, have the job breakdowns with you and follow them.

Explain and demonstrate. Give one step at a time. Don't throw the book at the trainee.

Stress key points. Don't waste time on trivia. A man's capacity to absorb and retain is limited.

Don't tell too much at one time. Telling too much at one time is teaching too fast.

Use simple language. Big or unusual words, or technical terms, may make some people think you're smart, but they won't help get over your ideas.

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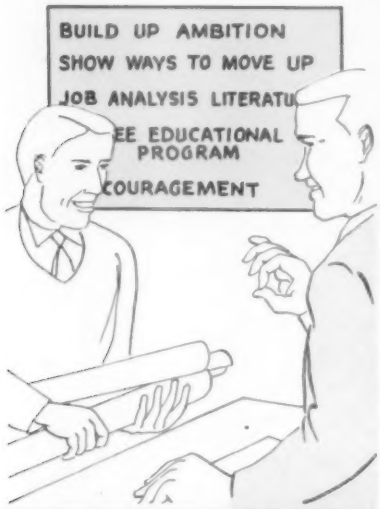
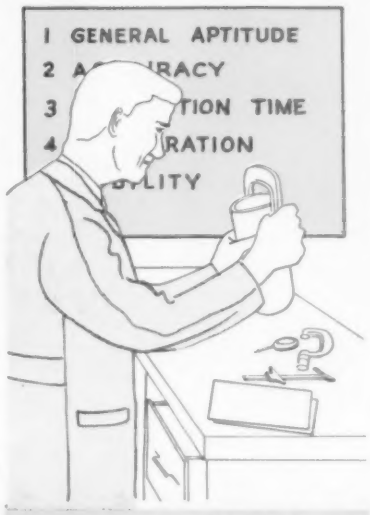
INSTRUCTION



Create desire to learn new duties



Test trainee frequently for job proficiency

Reward trainee for merit

Don't do all the talking. Men learn more from a discussion than they do from a lecture—and a discussion is a two-way affair. Men do more thinking during a discussion and they learn better when they think.

Set a high standard. You can't expect a trainee to do a first-class job after you've given a second-class demonstration. Your work always sets the standard.

Give reasons for methods or procedures. Things that have meaning are always learned more easily and remembered longer.

Show one thing at a time. Concentrate as much as possible on one thing until the trainee has learned to do it well.

5. "Try out" performance. Have him do the job. We learn, not from listening or from watching, but from doing—hence, the importance of having the trainee actually perform the job. Furthermore, by doing the job right he builds his self-confidence, and self-confidence is necessary for successful performance. One way to be sure that he will succeed is to start him on simple, easy tasks and gradually work toward the more difficult.

Have him tell you the why and how. Make sure that he can stress the key points

Correct errors and omissions as he makes them. Keep the following points in mind: Avoid criticism. Compliment before you correct. Let the trainee correct himself. Don't overdo correcting. Don't correct in front of others. Don't be too quick to blame the trainee.

Encourage him. Compliments are an essential part of teaching. They encourage learning. A sincere compliment gives the learner the experience of success.

6. Follow through. Put him on his own to do the job. After you are satisfied that the trainee can do the job, put him on his own. In this way he continues to build confidence in his own ability to do the job.

Encourage questions from the trainee. Be sympathetic to all his questions.

Check frequently. Check his performance as often as you deem necessary, but gradually taper off the coaching as his ability increases.

Let him know how he is doing. If the trainee is doing the job the way you want it done, tell him so, for this will add to his self-confidence. If he gets off the beam, tell him so. The time to correct an error is when it is made.

Material courtesy American Management Association.

ving your opinion and suggesting other subjects you would like. Address Editorial Department,
request. Also check back on previous features, December 24, 1956, issue, pages 85 and 76.

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— *Eugene Holman, Chairman of the Board, Standard Oil Company (New Jersey)*

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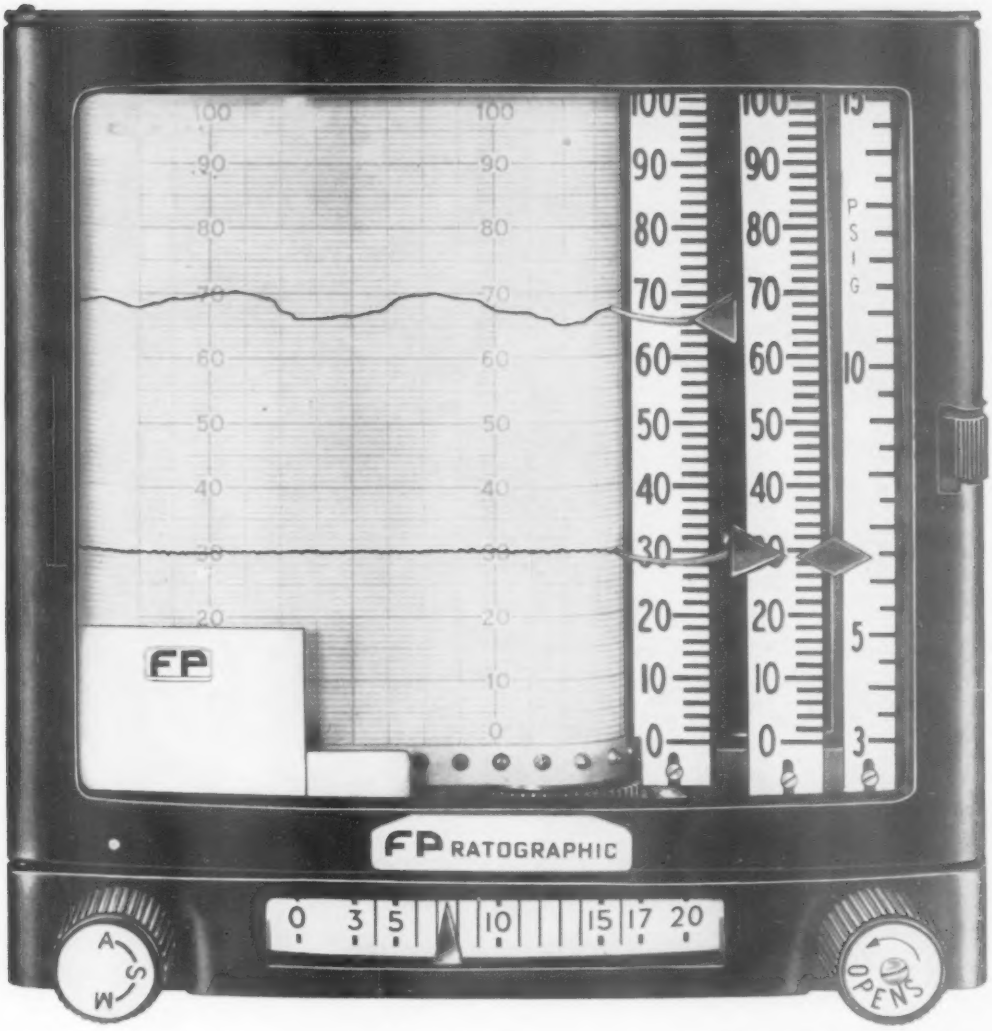

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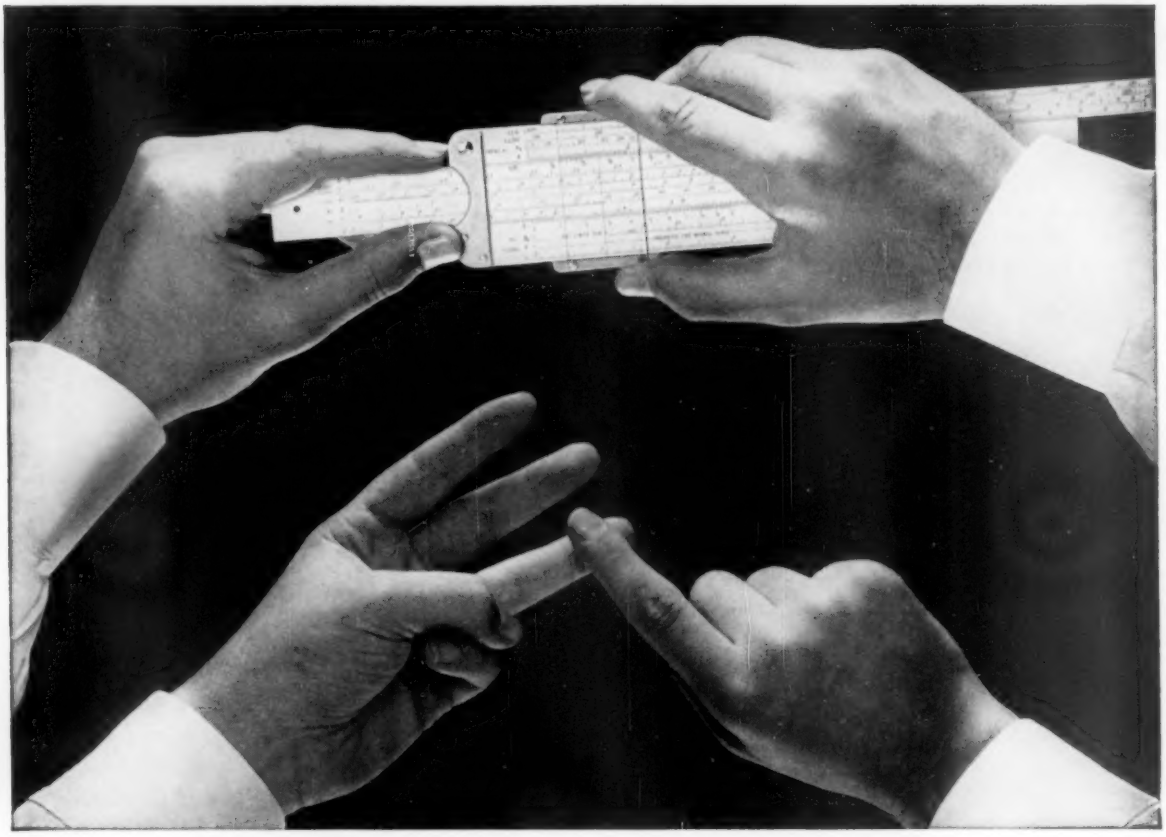

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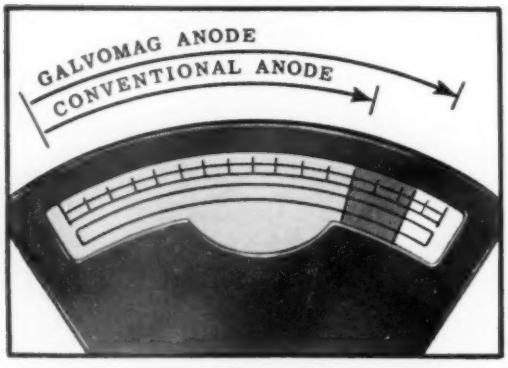

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Pipeline Patrol

. . . Report on Construction

Under Way, Contracted, and Planned

PIPELINE activity reported here is compiled from surveys conducted by The Oil and Gas Journal among pipeline companies and contracting firms. Projects listed include those proposed, contracted, and under way. Uncontracted projects are indicated by • preceding the project.

Crude-Oil Pipelines

• **Cape Pipe Line Co.** (organized by Sun Oil Co., Cities Service Co., Atlantic Refining Co.)

Project: Long range plans for line on the lower Delaware Bay to the Philadelphia refining area.

Completion: 1960.

Fulton, R. H. & Co., Lubbock, Tex.

Project: 39 miles of 6-in. from Donkey Creek field in northeastern Wyoming, southeast to the Osage pump station in Weston County.

Status: Fulton, a contractor has applied to Wyoming Public Service Commission.

Humble Pipe Line Co.

Project: 94 miles of 18-in. from its Ector Station near Odessa to its Kemper Station near Big Lake, Tex.

Status: Under way.

Contractor: **Lone Star Constructors,** H. A. (Red) Wylie, superintendent, office at Big Lake.

Completion: Mid-February 1957.

• **Interstate Oil Pipe Line Co.**

Project: 5 miles of 4-in. from South Bosco field, Louisiana, to present main line, and 5 miles of various size from Church Point field, Louisiana, to present main line.

Status: Proposed.

• **Northwest Pipeline Corp.** (an affiliate of Pacific Northwest)

Project 80 miles of 8-in. and 300 miles of 10-in. crude and products line from Four Corners area to Salt Lake City.

Status: To start May 1957.

Completion: August 1957.

• **Offshore Gathering Corp.,** Houston.

Project: 364 miles of mostly 20-in. in Gulf of Mexico off Louisiana. (Dual line.)

Status: Proposed.

• **Pasotex Pipe Line Co.**

Project: 127 miles of 20-in. along its route from Wink to El Paso, retiring another dual 8-in. section.

Status: Under way.

Completion: July 1, 1957.

Service Pipe Line Co.

Project: 9 miles of 10-in. and 1 mile of 6-in. to connect Lake Washington field in Plaquemines Parish, Louisiana, with a tank terminal at Port Sulphur on the Mississippi River.

Status: Under way.

Contractor: **Sam Carline, Inc.,** Berwick, La.

Completion: February 1, 1957.

• **Sinclair Pipeline Co.**

Project: 150 miles of 20-in. from Teague, Tex., to Houston.

Status: Planned for 1958.

Completion: 1958.

• **Tecumseh Pipe Line System** (Joint venture of Sinclair Pipe Line, Ashland Oil & Refining, and Pure Oil Co.)

Project: 190 miles of 20-in. between Griffith, Ind., and Cygnet, Ohio.

Status: Under way.

Completion: September 1957.

• **Texas-New Mexico Pipe Line Co.** (owned by The Texas Co., Sinclair Pipe Line Co., Tidewater Oil Co., and Empire Gas & Fuel Co.)

Project: 515 miles of 16-in. from southeast corner of Utah to Jal in southeastern New Mexico.

Status: Field surveys start January 1957.

Union Oil Co. of California.

Project: 45 miles of 12-in. and 180 miles of 16-in. crude and products line from San Joaquin Valley to its Oleum refinery at Rodeo, Calif.

Status: Under way.

Contractor: **Roy Price, Inc.**

Completion: April 1, 1957.

Products Pipelines

• **American Pipe Line Co.**

Project: Line from Gulf Coast to New York City area. Received ODM approval to amortize 40 per cent of $175,000,000 cost with a rapid writeoff.

Status: Planned.

Buckeye Pipe Line Co.

Project: Conversion of 116 miles of 8-in. crude to products between Huntington, Ind., and Griffith, Ind.

Status: Planned.

Contractor: **Sheehan Pipe Line Construction Co.**

Completion: Fall 1957.

Project: Conversion of 32 miles of 8-in. crude to products between Mantua, Ohio, and Youngstown area.

Status: Planned.

Contractor: Company will do own work.

Completion: November 1957.

• **El Paso Natural Gas Co.**

Project: 11 miles of 4-in. L.P.G. products from Snyder Line to South Andrews Plant. Texas.

Status: Planned.

• **Great Lakes Pipe Line Co.**

Project: 84 miles of 8-in. from south of St. Paul to Eau Claire, Wis.; 68 miles of 12-in. from Great Lakes intersecting point with Badger Pipe Line to Chicago.

Status: Construction scheduled to start spring 1957.

• **Gulf Refining Co.**

Project: 530 miles of 10-in. L.P.G. and natural gasoline line from Waddell Plant in Crane County, Texas, to Mont Belview near Houston (368 miles is conversion from crude service).

Status: Under way.

Contractor: **Panama-Williams Corp.** has 46 miles from Waddell Plant to Midland. Remainder not let.

• **Northwest Pipeline Corp.** (an affiliate of Pacific Northwest)

Project: 80 miles of 8-in. and 300 miles of 10-in. products and crude line from Four Corners area to Salt Lake City.

Status: To start May 1957.

Completion: August 1957.

• **Ohio Oil Co.**

Project: 350-miles of 12-in. from Wood River, Ill., to Chicago.

Status: Planned. Starting date depends on pipe delivery, which may not be completed until 1958.

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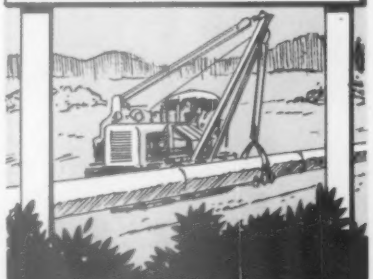

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Pipeline Patrol

• **Southern Pacific Pipe Lines, Inc.**
Project: 100 miles of 10-in., 80 miles of 8-in., and 125 miles of 6-in. between Richmond, Calif., and Fallon, Nev.
Status: Under way.
Contractor: **River Construction Corp.** has 84 miles of 8, 10-in. from Richmond to Stockton, Calif. to complete late spring 1957, F. O. Traweek, spread superintendent, office at Richmond. **Hood Constructtion Co.,** Lynwood, Calif., has 58 miles of 10-in. from Stockton to Roseville, Calif. **Engineers, Limited Pipeline Co.** and **Joe E. Young Pipe Line Construction Co.** have 18 miles of 6 and 8-in. between Roseville and Donner Summit.
Completion: August 1, 1957.

• **Union Oil Co. of California**
Project: 815-mile line from Rifle, Colo., to Los Angeles refining area, to carry products from its proposed Rifle shale-oil plant.
Status: Proposed.
Project: 14 miles of 8-in. between Rodeo and Richmond, Calif.
Status: Planned.
Completion: February 1957.

• **Yellowstone Pipe Line Co.**
Project: 22 miles of 8-in. near Spokane, Wash.
Status: Planned.
Completion: March 1, 1957.

Non-Petroleum Pipelines

American Gilsonite Co.
Project: 70 miles of 6-in. from Bonanza, Utah, to Grand Junction, Colo., to carry slurry of gilsonite from mines to refinery now being built.
Status: Under way.
Contractor: **Engineers Limited Pipe Line Co.**
Completion: Early 1957.

Natural-Gas Pipelines

• **Arkansas Louisiana Gas Co.**
Project: Line from Texas-Louisiana coastal region to northern Louisiana, to connect with their present system.
Status: Long-range plans.

• **Carolina Pipeline Co.**
Project: Distribution lines to serve 14 cities in Central South Carolina. Will buy gas from Transcontinental Gas Pipeline Co. or Southern Natural Gas Co.
Status: Has received South Carolina Public Service Commission permit.

• **Cities Service Pipe Line Co.**
Project: 27 miles of 6-in. from Lake Charles, La., to Orange, Tex.
Status: Planned.
Completion: April 30, 1957.
Project. 64 miles of 6 to 30-in. in Leavenworth and Anderson counties, Kansas, Cass County, Missouri, and Oklahoma County, Oklahoma.
Status: Planned.

• **Coastal Transmission Corp.**
Project: 575 miles of 12, 20, 22, 24-in. main line and 414 miles of 2 to 14-in. gathering lines between McAllen, Tex., and Baton Rouge, La.
Status: Has conditional FPC approval.
Completion: January 1, 1958.

• **Colonial Natural Gas Corp.**
Project: Two systems; one between Houston-Lake Charles area and Miami, Fla.; one in the Carolinas and Georgia.
Status: Proposed.

• **Colorado Interstate Gas Co.**
Project: 1957 program . . . 66 miles of 30-in., 40 miles of 34-in., 109 miles of 26-in., and 100 miles of 24-in. from Springfield, Colo., to Pueblo, Colo; 345 miles of 30-in. from Kit Carson, Colo., to Beatrice, Neb.; 50 miles of 22-in. from Laverne to Hooker, Okla.; 24 miles of 22-in. Panhandle field looping.
Status: Pending FPC approval.

Equitable Gas Co.
Project: 18 miles of 16-in. between Penn Township and Salem Township, Pennsylvania.
Status: Under way.
Contractor: **Rich Construction Co.**
Completion: February 1, 1957.

• **El Paso Natural Gas Co.**
Project: 338 miles of 34-in. from San Juan and Permian basins to California border.
Status: Under way.
Contractor: **R. H. Fulton Co.** has 102 miles; **Western Pipeline, Inc.,** has 144 miles; El Paso will construct remaining 92 miles.
Completion: April 1957.
Project: 83 miles of 34-in. from San Juan and Permian basins to California border, plus about 800 miles of gathering lines.
Status: Planned.

Fish-Service & Management Corp. (Agent for Cascade Gas Co.)
Project: City distribution system—205 miles

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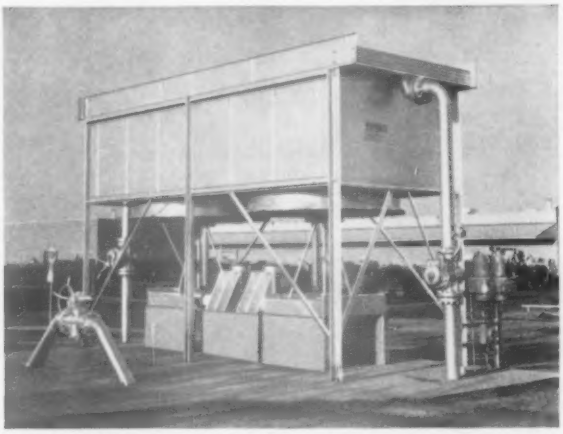

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Pipeline Patrol

of 1 to 8-in. in Washington and Oregon.

Status: Under way.

Contractor: **Ted Price Construction Co.**, Electric, Tex. Three spreads—M. E. Pulliam, spread superintendent, office at Walla Walla, Wash.; K. D. Garrett, spread superintendent, office at Pendleton, Ore.; E. E. Hanks, spread superintendent, office at Baker, Ore.

Completion: March 1957.

• **Houston Texas Gas & Oil Corp.**

Project: 943 miles of 26-in. between Baton Rouge, La., and Miami, Fla., plus 682 miles of sales laterals in Florida, with main line joining Coastal Transmission's proposed line from McAllen, Tex., to Baton Rouge.

Status. Has conditional FPC approval.

• **Iron Ranges Natural Gas Co.**, St. Paul.

Project: 68-mile transmission line and 47 miles of laterals to supply towns on the Mesabi Iron Range, Minn.

Status: Application pending with FPC.

• **Kansas-Nebraska Natural Gas Co.**

Project: 61 miles of various size gathering line in Camerick field, Texas County, Oklahoma.

Status: Approved.

Project: 10 miles of 10-in. between Grand Island and Fullerton, Nebr.

Status: Approved.

Completion: May 1, 1957.

Project: 12 miles of 12-in. between Scott City and Colby, Kans.

Status: Approved.

Completion: May 1, 1957.

Michigan Consolidated Gas Co.

Project: 67 miles of 10 and 12-in. between Sears and Travers City, Mich.

Status: Under way.

Contractor: **Somerville Construction Co.**: Floyd Huduall, spread superintendent, office at Cadillac, Mich.

Project: 60 miles of 10 and 12-in. between Muskegon and Ludington, Mich.

Status: Under way.

Contractor: **Somerville Construction Co.**, jointly with **J. L. Gentry Construction**: Frank Morris, spread superintendent, office at Hart, Mich.

• **Michigan Wisconsin Pipe Line Co.**

Project: 24 miles of 24-in. and 16 miles of 4-in. looping in Michigan, Indiana, Illinois, Wisconsin, Iowa, and Missouri.

Status: Approved.

Completion: 1957.

• **Midwestern Gas Transmission Co.**

Project: Will build main line from Portland, Tenn., to Canadian border near Emerson, Man.; 829 miles of 24-in., 109 miles of 16-in., 174 miles of 12-in., 648 miles of 3 to 18-in. extensions in Minnesota and Wisconsin.

Status: Application pending with FPC.

• **Mountain Fuel Supply Co.**, Salt Lake City

Project: 38 miles of line to connect with Pacific Northwest Pipeline Corp.'s system in Sweetwater County, Wyoming.

Status: Has temporary FPC permit.

• **Natural Gas Pipeline Co. of America**

Project: 350 miles of 20 and 26-in. from Jack and Wise counties, Texas, to Fritch, Tex.

Status: Has FPC approval.

Project: 389 miles of 36-in. loops along its line from Beatrice, Neb., to Chicago, to take gas from proposed line of Colorado Interstate Gas Co., and for 91 miles of 30-in. loops along parts of its main line.

Status: Application pending with FPC.

• **North Carolina Natural Gas Corp.** (Subsidary of Colonial Natural Gas Corp.)

Project: 575 miles of 3 to 16-in. from Transcontinental Gas Pipe Line Corp.'s system near Mooresville, eastwardly across north Carolina.

Status: Has permit from North Carolina Utilities Commission.

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Pipeline Patrol

• **Northern Natural Gas Co.**
Project: 160 miles of 2, 3, 6, 8-in. branch lines to serve 20 new communities on Aberdeen, S. D., line.
Status: Under way.
Contractor: **Troth Construction Co.**
Project: 73 miles of 20-in. from Savana Creek to Pincher Creek fields in Alberta, Canada; 32 miles of 24-in. from Pincher Creek to Montana border; 1,100 miles of 26-in. from Montana into Minneapolis.
Status: Planned.

• **Offshore Gathering Corp.,** Houston.
Project: 364 miles in Gulf of Mexico off Louisiana.; 60 miles of 24-in., 70 miles of 26-in., 234 miles of 30-in. (Dual line.)
Status: Application pending with FPC.

• **Ohio Fuel Gas Co.**
Project: 19 miles of 5, 12, 16-in. to replace or loop present facilities serving Dayton and Toledo areas, and extend service to McCutchenville.
Status: Pending FPC approval.

• **Pacific Gas & Electric Co.**
Project: 37 miles of 20-in., 37 miles of 18-in., 9 miles of 12-in. from Beehive Bend field near Willows, Calif., to near Davis, then to Sacramento.
Status: Under way.
Contractor: **Engineers Limited Pipeline Co.**
Project: 135 miles of 34-in. looping of the Topock-Milpitas line.
Status: Under way.
Contractor: A joint-venture firm, **Midwestern-Johnson-Dixon,** has 85 miles to complete this year.
Completion: Major part was laid in 1956; 52 miles to be completed in 1957.
Project: 200 miles of 12-in. from Sacramento Valley gas fields to Humboldt County, California.
Status: Has filed for approval of California's Public Utilities Commission. To start early 1957.
Completion: December 1, 1957.

• **Pacific Northwest Pipeline Corp.**
Project: 37 miles of 6-in. from Dove Creek to Nucla, Colo., and 13 miles of 4-in. from Nucla to Urvan, to serve Union Carbide Nuclear Co. and Vanadium Corp. of America.
Status: Has FPC permit.
Project: 1,000 miles of gathering lines and laterals along present line.
Status: Planned.
Completion: 1957.

• **Peoples Natural Gas Co.**
Project: 8 miles of 8-in. between Claysburg and Hollidaysburg, Pa.
Status: Planned.
Completion: August 1957.

• **Permian Basin Pipeline Co.**
Project: 83 miles of 16-in. from its Spraberry station in Midland County, Texas, to tie in with Pioneer Gathering System, Inc., at a point in northwestern Schleicher County, Texas.
Status: Filed for FPC approval.

• **Piedmont Gas Co.,** Hickory, N. C. (Parent is Carolina Natural Gas Corp.)
Project: 78 miles of 2 to 8-in. extension off Trancontinental in North Carolina to serve Gaston, Lincoln, Catawba, Caldwell, and Burke counties.
Status: Application pending with FPC.

• **Pioneer Gathering System, Inc.**
Project: 27 miles of 16-in. and 27 miles of 12-in. in Schleicher and Sutton counties, Texas.
Status: Filed for FPC approval. Estimate to start work March 1, 1957.
Completion: July or August 1957.

Southern California Gas Co. and Southern Counties Gas Co. of California.
Project: 241 miles of 30-in. from the outskirts of Los Angeles to Topock on the Arizona-California border.
Status: Under way.
Contractor: **R. H. Fulton & Co.**
Completion: June 30, 1957.

• **Southern Natural Gas Co.**
Project: 10 miles of 8-in. gathering lines between Napoleonville and Fort Jackson, La.
Status: Pending FPC approval.
Completion: August 1, 1957.

Spokane Natural Gas Co.
Project: 400 miles of 1 through 24-in. distribution system at Spokane.
Status: Under way.
Contractor: **Hallmac Construction Co.;** V. L. Williams, spread superintendent, office at Spokane.
Completion: 1957.

• **Tennessee Gas Transmission Co.**
Project: 221 miles of 30-in., 101 miles of 26-in., and 10 miles of 24-in. looping from Portland, Tenn., to Greenup, Ky.; from Morehead, Ky., to Catlettsburg, Ky.; from Catlettsburg to Broad Run, W. Va.; from New Wilmington, Pa., to Mercer, Pa.; and from New Castle, Pa., to near Pittsburgh, Pa.
Status: Pending FPC approval.
Project: 51 miles of 26-in., 51 miles of 20-in., and 17 miles of 12-in. gathering lines from Kinder, La., to offshore fields in Gulf of Mexico.
Status: Pending FPC approval.
Project: 577 miles of 30-in. from Mississippi River delta area south of New Orleans to Portland, Tenn.
Status: Pending FPC approval.
Project: 76 miles of 24-in. between Coudersport, Pa., and Hamburg, N. Y.
Status: Pending FPC approval.

• **Texas Eastern Transmission Co.**
Project: 422 miles of 30-in. from near McAllen to Beaumont, Tex., to move imported Mexican gas; 45 miles of 24-in. laterals from

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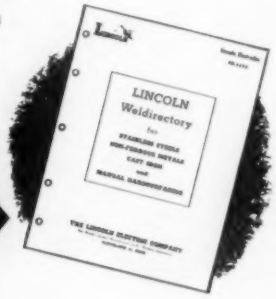
Now the easiest operating electrode for welding 18-8 stainless—*Try it*

For quality, for speed, there's no equal to Lincoln Stainweld A7 and A7-Cb. It has smooth operating characteristics in all positions without slag interference. Has easy slag removal. Low in price. Available in standard steel container or hermetically sealed container.

Stainweld A7 and A7-Cb operate on AC and DC for welding 18-8 stainless. Other electrodes are available for 25-12 Stainless, 18-12 Stainless and 25-20 Stainless.



Write for specifications and procedures in Lincoln Weldirectory SB-1352.

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- ★ CENTER RODS IN TUBING
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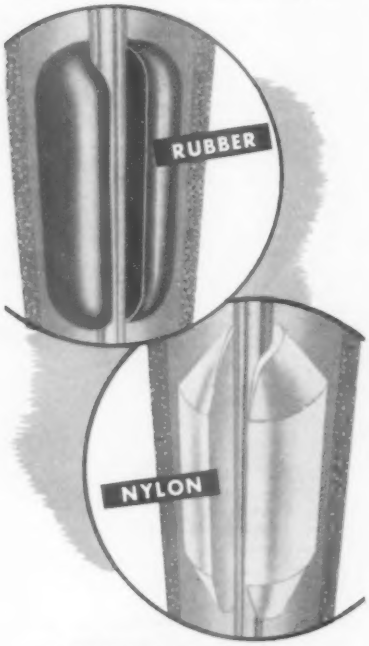

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Pipeline Patrol

McAllen to Provident City, Tex., 77 miles of 30-in. looping between Kosciusko, Miss., and Uniontown, Pa.; 147 miles of supply and sales laterals.

Status: Under way.

Contractor: **Houston Contracting Co.** has 121 miles of 30-in. between Angleton and Vidor, Tex., to start March 1, 1957. **H. C. Price Co.** has 70 miles of 30-in. **H. B. Zachry Co.** has 201 miles of 30-in. starting near McAllen and running northeast to near Angleton, Tex. **Grayco Constructors, Inc.** has 45 miles of 24-in. laterals from Blessing to Provident City. **Western Pipe Line, Inc.,** Austin, has 30-in. crossings at Nueces, Lavaca, and Carancahua bays. **Missouri Valley Dredging Co.,** Omaha, has crossings at Hinds and Guadalupe bays.

Completion: Fall 1957.

• **Transcontinental Gas Pipe Line Corp.**

Project: 25 miles of 36-in. loops from Louisiana to South Carolina, 31 miles of 36-in. and 43 miles of 30-in. line.

Satus: Pending FPC approval.

United Gas Pipe Line Co.

Project: 48 miles of 20-in. from Deep Lake field to the Lake Charles, La., area.

Status: Under way.

Contractor: **Brown & Root, Inc.**

Foreign Crude-Oil Pipelines

Arabian American Oil Co.

Project: 140 miles of 20-in. from Safaniya field in the Persian Gulf to Ras Tanura, Saudi Arabia, plus an 8-in. gathering system in the gulf.

Status: Under way.

Contractor: **International Bechtel Brothers, Inc.**

Completion: April 1, 1957.

Bolivian Gulf Oil Corp.

Project: 160 miles of 10-in. and 43 miles of 8-in. from Sicascia to Arica on the Chilean coast.

Contractor: **Williams Brothers Co.**

Completion: December 1957.

• **B-A Alberta Pipe Line, Ltd.**

Project: 35 miles of 8-in. to connect Drumheller field, Alberta, with existing lines running to Edmonton.

Status: Pending approval.

• **Interprovincial Pipe Line Co.**

Project: 151 miles of 20-in. to extend present line from Sarnia to Port Credit, Ont.

Status: To start May 1957.

Completion: September 1957.

Project: 33 miles of 24-in. from Kendal to Peebles, Sask.

Status: To start June 1, 1957.

Contractor: **Fulton-Banister, Ltd.**

Completion: July 31, 1957.

Project: 79 miles of 26-in. from Clearbrook, Minn., to Superior, Wis.

Status: To start June 1, 1957.

Contractor: **R. H. Fulton & Co.**

Completion: August 31, 1957.

• **Iraq Petroleum Co.**

Project: About 600 miles of up to 40-in. from Kirkuk field through Iraq and Turkey to the Turkish port of Iskenderun on the Mediterranean sea.

Status: Proposed. Survey completed.

Israeli Government

Project: 125 miles of 8-in. from Elath to Beersheba.

Status: Under way.

Completion: March or April 1957.

• **Mene Grande Oil Co.**

Project: 11 miles of 6-in. from Elias to Fria, and 10 miles of 10-in. from Limon to Leona-Dacion lateral, Venezuela.

Completion: First quarter 1957.

• **North-West Oil Pipelines Co.** (newly formed by six West German refiners, headed by affiliates of Standard Oil Co. (N.J.), and British Petroleum Co., Ltd.)

Project: 210-mile line from the refining centers in the industrial Ruhr area of West Germany to Wilhelmshaven.

Status: Planned.

Completion: 1959.

Pembina Pipe Line, Ltd.

Project: 100 miles of 3 to 10-in. gathering system in Pembina field.

Contractor: **Sparling Davis Co., Ltd.**

Project: 100 miles of 3 to 12-in. gathering line in Pembina oil field.

Contractor: **Mannix, Ltd.**; T. Childress, spread superintendent, office at Drayton Valley, Alta.

Completion: Fall 1957.

Rangeland Pipe Line Co.

Project: 48 miles of 12-in. between Sundre and the Sylvan Lake in south-central Alberta.

Status: Under way.

Contractor: **Dutton-Williams Brothers, Ltd.**

Completion: August 1957.

• **Royal Dutch-Shell**

Project: 700-mile line across Europe from the Mediterranean to the North Sea, running through Eastern France, Luxembourg, West Germany, and Netherlands, and Belgium. Main trunk to be 30-in.

Status: Company is considering project together with several other companies.

• **Sinclair Oil Corp. and Socony Mobil Oil Co.**

Project: 211 miles of 20-in. from the Silvestre field in Barinas, Venezuela, to Puerto Cabello on Caribbean Sea.

Status: Under way.

Contractor: **Williams Brothers Sudamericano, Ltd.**

Completion: July 1957.

Union of Soviet Socialist Republic

Project: 2,300-mile Trans-Siberian crude and products line from Ufa and the Tuimaza fields in Bashkiria to Irkutsk near Lake Baikal.

Status: Under way.

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A COMPLETE RANGE of 1½" to 36" in DIAMETER!

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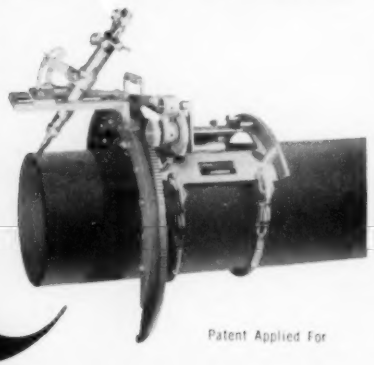

Patent Applied For

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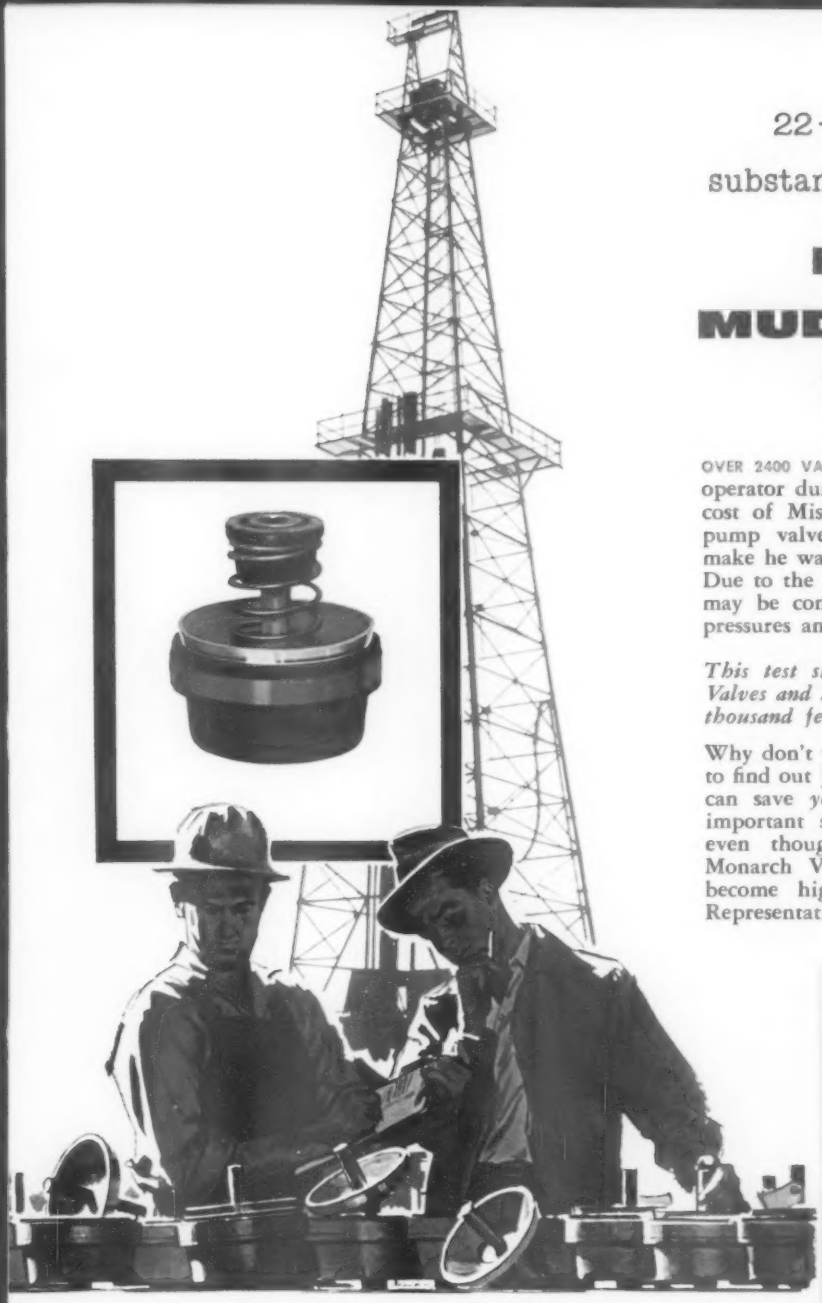

22-month test showed
substantial savings from using

MISSION MUD MONARCH VALVES

OVER 2400 VALVES AND SEATS were used by a large operator during a 22-month test comparing the cost of Mission Mud Monarch fluid end mud pump valves and seats with the competitive make he was using at the beginning of the test. Due to the size and duration of the test, results may be considered conclusive for the 2500-psi pressures and other conditions encountered.

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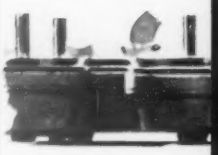

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FOUR REASONS WHY

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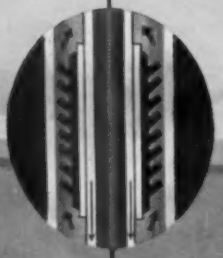
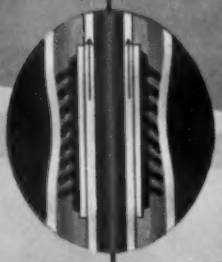
are fast, safe and economical



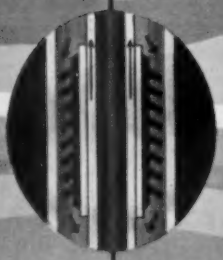
1. FREE FALLING

On the down stroke, clearance between fins and pipe allows swab to fall free.



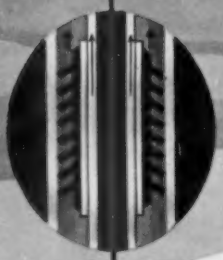
2. PASSES SMOOTHLY THROUGH TIGHT SPOTS

Flexible E-Z Swab Rubber fins allow swab to pass smoothly through tight spots on both up and down strokes.



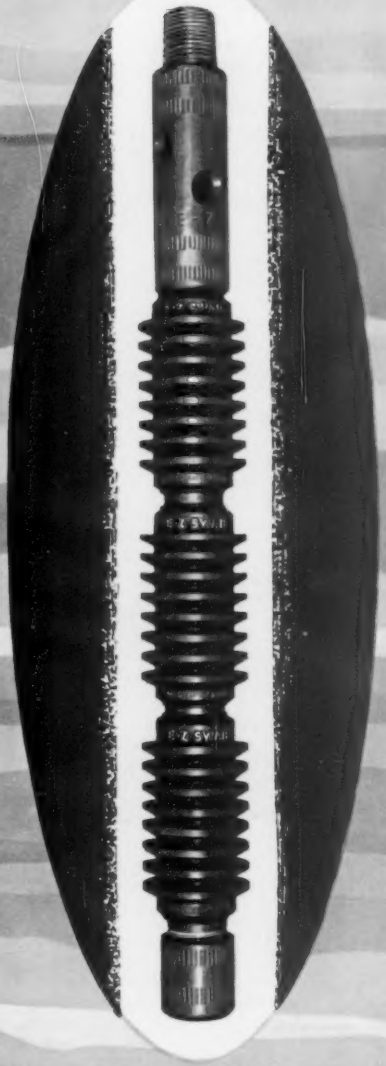
3. RELEASES OVERLOADS

When load is excessive, fins bend down to bypass excess fluid. This safety relief action prevents overloads and broken wire lines.



4. LONG LASTING

After overload is bypassed, fins spring up until they seal. Wear is slow because fins seal against pipe with light contact pressure.



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Mission E-Z Tubing and Casing Swabs are made in seven popular sizes (1½", 2", 2½", 3", 4½", 5½", and 7"). They are available through supply stores everywhere. Be sure to get a Mission E-Z Swab before your next swabbing job.

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Pipeline Patrol

• **Westspur Pipe Line Co.**
Project: 20 miles of 12-in. from Alida in southeastern Saskatchewan, to the Carnduff-Glen Ewen area to tap Cantal, Hastings, Florence, Carnduff, and Glen-Ewen fields; 34 miles of 4, 6, 8-in. gathering lines.
Status: Planned. Has requested permit from Board of Transport Commissioners.

Yacimientos Petroliferos Fiscales (Argentina)
Project: 932 miles of 12-in. from Campo Duran to San Lorenzo.
Status: Under way.
Contractor: **TECHINT** (Compania Tecnica Internacional), Buenos Aires, has 90 miles.
Project: 497 miles from Mendoza to Buenos Aires.
Status: Proposed. Bids will be taken beginning the end of January 1957.

Foreign Products Pipelines

Hydrocarbons Pipeline Co. (Subsidiary of Canadian Hydrocarbons)
Project: 800 miles of 6 and 8-in. L.P.G. line from near Edmonton, Alta., to Fort William, Ont.
Status: Has permit from Parliament of Canada. If approved by Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board, work will start early 1957.
Construction consultants: **Dutton-Williams Brothers, Ltd.**, Calgary, and **A. D. Little & Co.**, Boston.

Imperial Oil, Ltd.
Project: 37 miles of 12-in. from Waterdown to North Toronto, Ont.
Status: Under way.
Contractor: **Majestic Contractors, Ltd.**, Odis Hare, spread superintendent, office at Cooksville, Ont.

Israeli Government
Project: A 6-in. line from the Haifa refinery to Tel Aviv.
Completion: Late 1957.

National Iranian Oil Co.
Project: 573 miles of 10-in. from Ahwaz to Teheran, Iran.
Contractor: **Enterpose of Paris**, has northern 236 miles. Southern section completed.

• **North Atlantic Treaty Organization (NATO)**
Project: 2,000 miles of lines to airfields in parts of Europe.
Status: Under way.
Contractors: **Associated Pipeline Contractors, Inc.**, has 450 miles from Iskenderun, Turkey, to Batman. **TECHINT** (Compagnia Tecnica Internazionale), Milano, Italy, has 205 miles of 4-in. from Bandirma to Eskisehir, Turkey, and 250 miles of 8-in. from Antalya to Eskisehir. Bids were taken in January 1956 on 300 miles of 12-in. between Marseille and Langres, France. Taking bids on 275 miles in northwestern France: 54 miles of 2-in. from Langres to Mirecourt, 63 miles of 2-in. from Mirecourt to Phalsbourg, 47 miles of 8-in. from Mirecourt to Metz, 30 miles of 8-in. from Phalsbourg to Deux Ponts, 35 miles of 8-in. from Phalsbourg to Strasbourg.

United States Defense Department
Project: Sponsoring 485 miles of 8, 10, 12-in. from Cadiz to Zaragoza, Spain.
Contractors: Prime contractor — **Brown-Raymond-Walsh; Merritt Chapman & Scott, Benson & Montin** of Oklahoma City, **Agroman Construcion Co.** of Spain.

Foreign Natural-Gas Pipelines

• **Alberta Gas Trunk Line Co., Ltd.**
Project: 637 miles of 34 to 16-in. gathering lines in Alberta.
Contractor: **Dutton-Williams Brothers, Ltd.**, has preliminary studies, design and management-engineering. **Mannix, Ltd.**, has crossing of Red Deer River near Cavendish, Alta., J. Hysuick, spread superintendent, office at Empress.
Status: Mannix, Ltd., work to be completed March 1957.

Andes Pipeline Corp. (Subsidiary of Glenn McCarthy, Inc.)
Project: 500 miles of 12-in. from McCarthy's Bolivian concession to the Chile copper-mining area.
Status: Proposed.
Contractor: Will do own work.

• **Attock Oil Co.**
Project: 60 miles of line from Dhulian field to Rawalpindi in West Pakistan.
Status: Planned.

Cia. Shell de Venezuela.
Project: 177 miles of 20-in. from La Paz field in the Maracaibo district, to the Cardon refinery on Paraguana Peninsula, to fuel refinery furnaces.
Status: Under way.
Contractor: **Williams Brothers Co.**
Completion: 1957.

• **Empresa Nacional Del Petroleo.**
Project: 80 miles of 10-in. from Concon to Santiago, Chile.
Status: Planned.

Inland Natural Gas Co., Ltd.
Project: 350 miles of 12 to 4-in. system between Savona and Nelson, British Columbia, and 400 miles of distribution piping in 31 towns.
Status: Clearing and grading under way.
Contractor: **Dutton-Williams Brothers, Ltd.**; Pat Campbell, project manager, office at Penticton.
Completion: October 1957.

Petroleos Mexicanos
Project: 130 miles of 22-in. to parallel a

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14-in. line from Reynosa to Monterrey in northern Mexico.

Status: Planned.

Saskatchewan Power Corp.

Project: 300 miles of 1 to 20-in. distribution system at Regina City.

Status: Will start in 1957.

Contractor: **Fulton Banister, Ltd.**

Completion: October 15, 1957.

South Alberta Pipe Line, Ltd.

Project: 150 miles of 8-in. from Etzikom field to serve a nitrochemical plant to be built near Medicine Hat, Alta.

Status: Filed for permit.

Sui Gas Transmission Co.

Project: 188 miles of 16-in. from Sui gas field to Moultan, Pakistan.

Status: Under way; to be extended later to Lahore with branches at Kot Addu, Jhang Magiana, and Montgomery.

Contractors: **Pakistan Constructors,** a joint company of **Morrison-Knudsen** of Boise, Idaho, and **William Press, Ltd.,** of London.

Technical Office of Hydrocarbon, Ministry of Mines and Petroleum, Government of Venezuela.

Project: 207 miles of 26-in. from Anaco fields to Caracas.

Status: Under way.

Contractor: **Fulghum Contracting Corp.** will be consultants; **Petrogas, S. A.** will engineer and construct the line.

Completion: Spring 1959.

• **Trans-Canada Pipe Lines, Ltd.**

Project: 574 miles of 34-in. from the Alberta-Saskatchewan border to Winnipeg. (First part of 2,250-mile line from Alberta to Toronto and Montreal.)

Status: Under way.

Contractors: **Majestic Contractors, Ltd.** (104 miles from Burstall to Stewart Valley, Sask., R. L. Leaonard, spread supt., office at Cabri.; **Canadian Bechtel, Ltd.** (110 miles from Swift Current to Moose Jaw, Sask., J. L. Work, general supt., office at Moose Jaw, and 54 miles from Partoze La Prairie to Winnipeg); **Mannix, Ltd.** (90 miles from Moose Jaw to Welseley, spread superintendent, T. Anderson, office at Montmartre, Saskatchewan); **Dutton-Williams Brothers, Ltd.** (97 miles from Deveren to Moosomin, under way, to complete August 1957). **Price-Poole of Canada, Ltd.** has 100 miles from Miniota to near McGregor to start in 1957.

Completion: Late summer 1957.

Union of Soviet Socialist Republic.

Project: 900 miles of 26-in. from Stavropol in the Northern Caucasus to Moscow. The line, larger than Russia's other two major gas lines which are only 16 and 18-in., will serve Voroshilovgrad, Voronezh, Tula, Yelets, and Serpukhov.

Status: Under way; approximately 50 per cent completed.

Westcoast Transmission Co., Ltd.

Project: 650 miles of 30-in. from Peace River area, Canada, to Sumas, Wash.

Status: Under way. About two-thirds completed.

Contractors: **Dutton - Williams Brothers, Ltd.,** has 120 miles from Taylor, B. C., to Azouzetta Lake, completed; **Mannix, Ltd.,** has 110 miles between Huntingdon and Merritt, G. Lyons, spread superintendent, office at Hops, B. C.; **Canadian Bechtel, Ltd.,** has 210 miles from Alexandria to Pine Pass, B. C., H. F. (Hank) Mogg, spread man, office at Quesnel, B. C.; **R. A. Conyes Construction Co.,** has 210 miles; **River Construction Corp., Ltd.,** has under way 150 miles of gathering lines in northern Alberta and British Columbia; **Marine Pipeline & Dredging, Ltd.,** has Fraser and Peace River crossings.

Completion: Dutton-Williams section completed. R. A. Conyes section and Canadian Bechtel section to be completed September 1957. Marine Pipeline work to be completed April and May 1957.

Project: 174 miles of 30-in. from Savanna Creek area to the Canadian-Idaho border.

Status: Planned.

• **Yacimientos Petroliferos Fiscales (Argentina)**

Project: 1,556 miles from Campo Duran to Buenos Aires.

Status: Proposed. Bids will be taken beginning the end of January 1957.

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S. T. "Buck" Dotson of Big Chief Drilling Co. now buys Mudwonder Mudline Valves for less maintenance.

Edward Valves, Inc., Subsidiary of Rockwell Manufacturing Company, East Chicago, Ind.

Among the
Drilling Contractors

Bass Drilling Co. has a new contract operation under way about 2 miles south of Seadrift, in Calhoun County, Texas Gulf Coast. It is an 8,500-ft. test for Fort Bend Oil Co., of Houston, at 1 Bennett, in the M. Campos Survey. Location is less than a half mile from the east shore of San Antonio Bay.

Tine Gaiser Drilling Co., Bakersfield, Calif., has a rig working on contract for Western Gulf Oil Co. at a wildcat location in the Waukena area, 3 miles east of Corcoran, in Kings County, northern California. It is a 5,000-ft. test at 1 Swift, spotted in 16-21-23.

Tandem Drilling Co. has a rig running on a 7,500-ft. Smackover test in the Cairo area, in Union County, southern Arkansas. Tandem is a joint operator with Georesearch, Inc., and Kin-Ark Oil Co. Location, at 1 Warren, in 28-17s-17w, is 2¼ miles north of Smackover production in Cairo field.

Trimble Drilling Co., Inc., Magnolia, Ark., has a new contract operation in eastern Union County, southern Arkansas. It is a 6,300-ft. Smackover test for George Belchic, Jr., of Shreveport. Location, at 1 Olin, in 25-18s-12w, is 2½ miles northwest of Lapile. It is south of New London field.

United Drilling Co. is keeping a rig working for Leland Fikes, of Dallas, in the Navarro Crossing area, 12 miles west of Grapeland, in Houston County, East Texas. Present operation is 2 Shepherd, in the Nathan Wade Survey. It is a 6,050-ft. Woodbine job.

Walter Harris & Sons have a rig on an extension location in the Starr Valley area, Payne County, Oklahoma, where they are drilling for Wilcox Oil Co. The test, 1 Vollmar, in 3-19n-3e, is to be carried to the Red Fork about 4,000 ft.

J & B Drilling Co. is on a new operation in the Bayou Mallet area of Acadia Parish, southern Louisiana. It is a contract job for James M. Cunningham at 1 Richard, in 19-7s-2e. Location is northeast of the field. Plans call for a 9,050-ft. test.

Field Drilling Co., San Antonio, is scheduled for another 5,000-ft. wildcat Hillcrest Oil Co. and George H. Coates will drill in the area 8½ to 9 miles northwest of San Diego, in northeastern Duval County, Southwest Texas. Location is at 1 Huizar, in H&GN Survey 19. Field's rig now is on the operator's 1 Parr, in the T. C. Rogers Survey 22, about a half mile northwest.

Kirkpatrick Drilling Co., Corpus Christi, is drilling for Sunray Mid-Continent Oil Co. in the Flores area, 12 miles northeast of Sullivan City, Hidalgo County, in Texas' Rio Grande Valley. Latest contract is at 5 Guadalupe G. Zamora, another 5,000-ft. job in the W. D. Parchman Survey 883.

Norton Drilling Co. has contracted for another wildcat test Bateman Drilling Co. is undertaking in the "Head of Passes" area, in the lower delta marshes of Plaquemines Parish, Louisiana. Location is on the west side of Mississippi River, between it and West Bay field. It is Bateman's second test on the Delesdernier lease. First test, a mile distant, was dry. Contract is for 9,000 ft.

Newton Drilling Co., Coalinga, Calif., is drilling a 3,500-ft. wildcat test 2½ miles east of Ant Hill field, just north of Bakersfield, in Kern County, California. It is at 26X-13 SPL, in 13-29-29.

Moutray Drilling Co., is contractor on a 5,700-ft. Morrow wildcat test Anderson-Prichard Oil Corp., of Oklahoma City, is putting down about 7 miles west of Manter, in Stanton County, far-western Kansas. Location, at 1-E Stewart, in 28-29s-43w, is near the Colorado line. It is 7 miles northwest of Sparks pool, nearest production.

Parker Drilling Co., Tulsa, has contracted for a deep test Gulf Oil Corp. is undertaking in the Dean Permo (Pennsylvanian) area 7 miles northeast of Lovington, in Lea County, southeastern New Mexico. Location is at 1 Lea State "HG," in 25-15-36. Plans call for 11,750-ft. drilling.

Douglas Drilling Co. has a shallow-sand operation for Gulf Interstate Engineering Co., of Houston, northeast of South Crowley field, in Acadia Parish, southern Louisiana. The test, 2 Jeffers, in 23-10s-1e, is being started as a twin to a 10,200-ft. gas-condensate well recently completed by the same operator.

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Composite Catalog Page 3369

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The shallow sand, indicated in the deeper well, is at a depth of about 3,300 ft.

H. L. Rowley, Inc., Shreveport, is getting started on a 5,800-ft. Rodessa test it has contracted to drill for Atlantic Refining Co. on the south flank of Ada field, in Bienville Parish, North Louisiana. Location is on Atlantic's Courtney gas unit, in 5-17n-7w.

Sierra Petroleum Co. has taken on a contract job in northwestern Logan County, in far-western Kansas. The test, a remote wildcat, is for McCliffe Oil Co. Location, at 1 Luther, in 12-12s-37w, is 1½ miles northeast of McAllaster, and about 15 miles northwest of Russell Springs. Nearest production is the recently opened Oakley pool, about 28 miles east. Drilling is set to go to 5,400 ft.

Oil Corp. has taken on a contract job calling for a 6,500-ft. test at a wildcat location 5 miles southwest of Sinton, in San Patricio County, South Texas. It will be drilled for Cosden Petroleum Corp. at 1 Touchstone, in Tract 8, Coleman Fulton Pasture Co. Subdivision.

M & M Drilling Co., Houston, has a rig under contract to Bateman Drilling Co., of New Orleans, for another deep test in the Frisco area, Pointe Coupee Parish, southern Louisiana. The test is Bateman's 1 LeJuene Unit 1, in 35-5s-9e. Planned objective is 10,550 ft.

Snow Hill Drilling Co., Inc., Magnolia, Ark., is starting on a new contract operation in the Snow Hill area, southern Ouachita County, in southern Arkansas. It is a 4,600-ft. lower Cotton Valley test for Don H. Peaker and others at 5 Reynolds Brothers. Spot is in 27-15s-15w.

Johnson Drilling & Service Co., Magnolia, Ark., is drilling for Sunray Mid-Continent Oil Co. on a new Pettet well on the southwest flank of Redland field, in Bossier Parish, northwestern Arkansas. Designation of the well is 1 Bolinger & Co. Spot is in 32-23n-12w. Permit calls for a 6,400-ft. test.

H. H. Stout Drilling Co., Inc., Shreveport, has a new wildcat operation going about 2 miles northwest of Transylvania, in the central part of East Carroll Parish, northeastern Louisiana. It is a contract job for **Barnwell Drilling Co.,** also of Shreveport, at 1 Brown, in 26-20n-12w. Plans call for a Cotton Valley test with objective about 5,500 ft.

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Showcase

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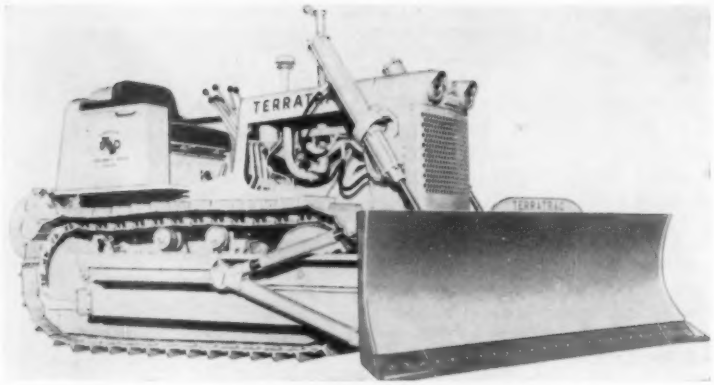

Industrial Line Includes 20 Tractors

A new line of industrial wheel tractors, crawlers, and earth-moving equipment is offered. This new line covers 20 gasoline and diesel-powered tractors, which range from 40 to 80 hp. in rubber-tired equipment, and up to 100 hp. in crawler models. The line offers over 50 combinations of matching backhoes, loaders, bulldozers, angledozers, scarifiers, forklifts, trailers, and winches.

The new rubber-tired tractors feature a drop-forged front axle, power steering, shuttle transmission, and a foam-rubber seat. These wheel tractors are industrial in appearance and include bumpers, radiator guards, and a heavy subframe assembly for mounted equipment.

The crawlers in the 80 and 100-hp. class have a new counterrotating power-shifting transmission. This provides independent power control of each track, both as to speed and direction. **Write or call J. I. Case Co., Racine, Wisc., for more information on the industrial-tractor line.**

•

Floor Machine Safety Tested, Won't Shock Operator

The improved, explosionproof Commander floor machine has 16 and 20-in. brushes. It can be used for safe maintenance of floors in refineries, field-processing plants, and other hazardous places. Wiring from motor to handle is eliminated because the electric switch is mounted on the motor housing. A start-and-stop control is retained on the handle.

The entire unit is constructed, safety-tested, and sealed to prevent sparks and static that could ignite explosive gas, fumes, or vapors. A static-eliminator wire in the brush prevents shock to operator. The gear is grease sealed for life and instant-change attachments enable the user to handle many jobs

Send this *Showcase Coupon* to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in boldface type at end of description.

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other than polishing. **Write or call: Holt Manufacturing Co., 669 Twentieth Street, Oakland 12, Calif., for more information on the Commander floor machine.**

•

Tank Fittings Cut Evaporation Losses

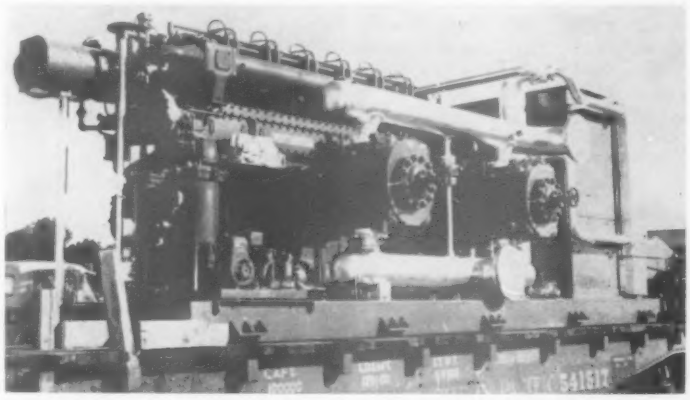
A new line of fittings for storage tanks has been introduced. The line includes gage hatches which provide automatic closing and vapor-tight sealing. These hatches have a resilient seal in the cover which cushions the impact of closing and provides a vapor-tight fit.

Other new tank fittings include: (1) screened free vents which allow unimpeded free flow of air and vapor, (2) breather vents which have diaphragm seals, (3) water-drain valves with steel bodies and resilient seats, and (4) automatic tank gages. **Write or call Wheaton Brass Works, Union, N. J., for tank fittings catalog No. 66.**

•

Map and Blueprint File Features Card-File Control

A metal map and blueprint file with locking doors is now available in a variety of sunshine colors to match other office filing equipment. The MT4 file is finished in desert sage, mist green, autumn haze, silver gray, brown, and charcoal. Other colors to match submitted color samples are available on request. All files feature a card-file control for locating any filed map or print, a tilting base to accommodate filed items to 60 in., and a storage shelf. **Write or call: Scott-Rice Co., 610 S. Main Street, Tulsa 3, Okla., for more information on the MT4 file.**



Oil-Field Compressors Are Turbocharged

A new turbocharged gas-engine compressor is named the SLHC. It is in the 330-880 hp. range. The first of these compressors is now in operation in a gas-gathering station of Northern Natural Gas Co., at Muncie, Okla. This six-cylinder unit is pumping gas from 25 wells to one of Northern's main-line stations at Hugoton, Kans.

The turbocharger derives its energy from exhaust gas. It compresses ambient intake air to a higher pressure for cylinder charging. This gives greater power per unit of space.

The compressor is designed for: gas gathering; pipeline and distribution service; field-processing plants; for pressure maintenance in oil fields; for refinery operations such as vapor recovery, recycling, and stabilization of gases; for refrigeration systems; and for petrochemical plants. **Write or call Worthington Corp., Harrison, N. J., for more information on the SLHC turbocharged compressor.**

•

Dope Kettle Employs Double Agitation

The new Model SPX dope kettle uses both sweep and propeller agitation of the dope mixture. No coking is required. The bottom sweep never allows deposits to form. The filler doesn't settle because of double agitation and a steady, constant temperature is maintained. An Internationl U-123 engine develops 31.2 hp. It is coupled with a Ramsey transmission and clutch which drives the marine type of propeller. Kerosine capacity is 70 gal. and engine-

OIL AND GAS JOURNAL *Showcase* ..... OF NEW EQUIPMENT

fuel capacity is 7 gal. for approximately 10 hours service. Direct hydraulic power drives the sweeping arm inside the kettle. This action insures a constant temperature and a trouble-free system of agitation. Hydraulic-oil capacity is 9 gal.

The SPX has an insulated shell to retain heat and minimize the time required to melt the dope. The insulator is a 2-in. thickness of rock wool over all exposed surfaces. This insulation keeps dope at a high temperature even over night. The kettle is narrow enough to be hauled on flat-bed trucks. By removing two pins the kettle tongue may be folded up so that an additional 3 ft. of truck-bed space is gained. **Write or call: Crutcher-Rolfs-Cummings, Inc., Box 2073, Houston, Tex., for more information on the SPX dope kettle.**

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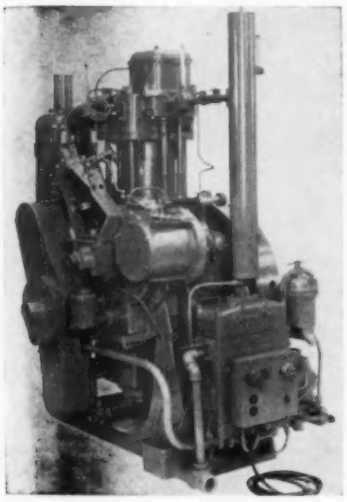

One-Cylinder Diesel Tests Lubricants

This single-cylinder diesel test engine serves as a tool to determine oil characteristics. It is a standard for test procedures and is one of the few diesel test engines built for sale. Most of the engines have been sold to oil companies for use in testing diesel-engine lubricants. Since 1936 over 200 have been delivered to oil-company laboratories, independent research groups, and military research organizations in countries from Formosa to South Africa.

The basic-engine arrangement is a naturally-aspirated 5¾ by 8-in. single-cylinder diesel test engine. Engine accessories include heat exchangers for cooling the lubricating oil and cooling-system water, oil and water-temperature controls, and temperature-measuring equipment. The lubricating-oil tests are run normally at approximately 22 b.hp. at 1,000 r.p.m. for 480 hours. **Write or call: Caterpillar Tractor Co., Peoria, Ill., for more information on the single-cylinder diesel test engine.**

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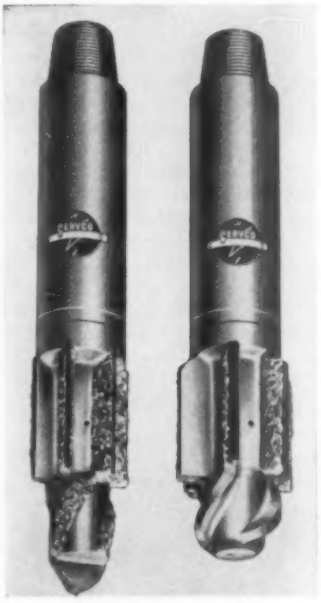

Liner Mill Uses New Method That Speeds Milling

This new liner mill is used to mill up liners, both inside the casing and below the casing shoe. It uses a new method wherein particles of tungsten carbide are suspended in a tough, elastic matrix. Hundreds of cutting edges are always in contact with the surface to be cut. New particles are exposed automatically as particles are worn away or torn from the matrix. This method allows fast milling.

The liner mill is simple to operate. It can be used by the driller and there is no need to call in a specially trained man.

The new tool mills the liner completely. It mills both perforated liner and prepacked gravel liners with wire-mesh wrap, and mills off the top of damaged casing for easy followup with washover shoes. The pilot of the liner mill also can be dressed to cut out collapsed liners ahead of the cutting edges and to clean out scale, sand, and other drillable obstructions. **Write or call: Servco Corp., 2450 Cerritos Avenue, Long Beach 6, Calif., for more information on the liner mill.**

Send this *Showcase Coupon*
to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in boldface type at end of description.

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OIL AND GAS JOURNAL

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- BULLETINS
- CATALOGS
- BROCHURES

Philadelphia Series HP High-Pressure Pumps. The new catalog HP-1254 offers pumps for pressures to 35,000 psi. and capacities to 2,000 g.p.h. They can be used: (1) to charge systems; (2) to maintain pressure head in hydraulic-accumulator systems; and (3) for flow blending in high-pressure processing lines. There are 298 models offered in 3 basic pump-frame sizes for 2-in., 3-in., and 4-in. pump strokes. **Write or call: Philadelphia Pump & Machinery Co., 13500 Philmont Avenue, Philadelphia, Pa., for Catalog HP-1254.**

●

Polyvinyl Chloride Eductors are illustrated and described in the two-page bulletin supplement 2M-PVC. The PVC eductor is recommended for liquid pumping and mixing operations and, when particle size permits, the handling of solids. Performance characteristics are similar to those of the equivalent size standard metal units. This supplement includes tables of dimensions, capacities, and a list of recommended uses. **Write or call: Schutte & Koerting Co., Dept. JA-1, Cornwells Heights, Bucks County, Pennsylvania, for Bulletin Supplement 2M-PVC.**

●

Equity 32' Water Taxi. This boat is described in a four-page folder which contains photographs, specifications, and an equipment list. The Water Taxi can seat 11 men. It is used by oil companies, crew boat operators, cement companies, and contractors. It is an all-steel, welded boat that can be furnished with either a single or twin screw. Engines allowing speeds to 36 m.p.h. can be specified. **Write or call: Equitable Equipment Co., Inc., 410 Camp Street, New Orleans 12, La., for more information on the Equity 32-ft. Water Taxi.**

●

Brooks By-Pass Rotameter is covered in the looseleaf-punched, two-color Bulletin 116. The instrument permits economical measurement of large fluid-flow rates in pipe sizes of 2 in. and above. It features linear response, wide range (up to 10 to 1), direct-reading scale, and ability to handle corrosive fluids. It eliminates overload checks, seal pots, and equalizing valves. The bulletin includes photographs, capacity tables, and engineering drawings. **Write or call: Brooks Rotameter Co., Lansdale, Pa., for Bulletin 116.**

●

Anderson Air-Release Valves are presented in the two-color, looseleaf-punched Bulletin 856. These new air-release valves are used for: (1) venting air from hot-water heating systems; (2) venting air from chilled-water cooling and air-conditioning systems; and (3) to release air from pipelines and other equipment such as water mains, water filters, tanks, and brine lines. This literature gives valve specifications and capacities. The valves withstand pressure to 500 psi. **Write or call: V. D. Anderson Co., 1935 West Ninety-sixth Street, Cleveland 2, Ohio, for Bulletin 856.**

●

Dow Corning Silicone Lubricants are described in the eight-page, two-color booklet No. 6-101. It discusses properties and performance of various silicone oils, greases, and compounds. It includes helpful technical data in easy-to-understand tables and graphs. Special attention is given to high-speed, high-temperature ball-bearing problems. **Write or call: Dow Corning Corp., Midland, Mich., for the booklet No. 6-101.**

●

Haveg Teflon Equipment. The illustrated Bulletin T-50 is the first of a series which covers this plastic resin as a material. It details Teflon's properties: inertness to practically all chemicals, excellent dielectric properties, resistance to a wide range of temperatures, low-friction characteristics, and weather resistance. It describes Teflon products which include thin-and heavy-walled tubing and rod, steel-pipe lining, insulated wire, machine parts, and sheet. **Write or call: Halocarbon Div., Haveg Industries, Inc., 900 Greenbank Road, Wilmington 8, Del., for Bulletin T-50.**

●

Series 254-U Corrosion-Resistant Rerated Motors are detailed in the multicolor eight-page Bulletin No. 520. It describes the new motor which features corrosion-resistant steel housing which offers protection against adverse weather conditions. Integral metal and cast-iron parts are also given the anticorrosion treatment. Housing protects internal parts against entry of debris and other foreign objects. Bulletin includes multicolor cutaway drawings and a branch-office list. **Write or call: Robbins & Myers, Inc., Industrial Motor Div., Springfield, Ohio, for Bulletin No. 520.**

●

Selas Combustion Safeguards. Bulletin SC 1006 describes the operation and construction of automatic fire checks. They detect, localize, and extinguish flashback in mixture supply lines where a combustible mixture of fuel gas and air is distributed to heating equipment. The bulletin also describes safety blow-outs which prevent flashback and relieve excessive flash back pressure iin combustible-mixture main-supply piping. The 12-page, two-color booklet includes photographs, engineering drawings, and piping arrangements. **Write or call: Selas Corp. of America, Dresher, Pa., for Bulletin SC 1006.**

●

Self-Supporting Jib Crane. This folder illustrates and describes cranes with capacities from 6 to 15 tons. They require less than 5 sq. ft. of floor space, yet serve an area of 1,936 sq. ft. The folder includes photographs and two-color detail and engineering drawings. The cranes have 360° rotation, are self-supported on either base-mounted or pillar-mounted columns, and handle loads under 30,000 lb. **Write or call: R. G. LeTourneau, Inc., 2399 South MacArthur, Longview, Tex., for the jib-crane folder.**

●

Delta Gas Dehydrators are described and illustrated in a 14-page, 2-color catalog and sizing manual. The dehydrators are of the glycol type. The booklet presents installation photos, flow diagrams, and an explanation of how the dehydrators work. It also tells how to size a glycol dehydrator and provides the calculations and tables needed. **Write or call Delta Tank Mfg. Co., Baton Rouge, La., for the dehydrator catalog and sizing manual.**

●

Sulfuric-Acid Unloading and Handling Instructions. Up-to-date instructions for the safe unloading and handling of sulfuric acid are presented in easy-to-read form on a new 17 by 22-in. wall chart. The chart is printed in two colors, red and black, on special moisture-resistant paper. It describes step by step the proper methods for pump unloading of tank cars. Diagrams of piping arrangements are shown. A list of safety do's and don'ts are included. **Write or call Olin Mathieson Chemical Corp., 460 Park Avenue, New York 22, for the sulfuric-acid handling chart.**

EQUIPMENT MEN . . . in the News

J & L Supply Makes Sales-Staff Changes

Duane C. Wixson, sales representative for Jones & Laughlin Supply Division, has been transferred from Hill City, Kans., to the Russell, Kans., area. Verlyn I. Ginther has been promoted to sales representative at Hill City. W. L. Wolfe, vice president-sales, made the announcement. Wixson has been with J & L since 1947 and Ginther since 1950.

United Supply Makes Mid-Continent Changes

Jack Blalock was transferred as assistant district manager to the West Texas-New Mexico division for United

JACK BLALOCK

R. H. SHIPLEY

Supply Co. R. H. Shipley was promoted to succeed him in Ardmore, Okla. Brooks Guetelius, Jr., president, made the announcement.

Blalock started with the company in Texas and was made head floorman at Velma, Okla., in 1948. He later served as salesman in Velma and Oklahoma City. After duty in Korea, he became store manager at Velma. He had held that position for 7 years.

R. H. Shipley was a field salesman before becoming store manager at Velma. He had held that position for 7 years.

Bristol Co. Opens New Factory in Southwest

The Bristol Co. of Waterbury, Conn., has just opened a new branch factory and warehouse in Houston. This move reflects the shifting market for automatic controlling, and telemetering instruments.

The company was founded at its present New England headquarters in 1889. As industry moved west, the company opened a branch factory and repair laboratory in Chicago. Later it opened another branch in San Francisco.

Perforating Guns Atlas Holds Sales Conference

The annual sales engineering conference was attended by Perforating Guns Atlas Corp.'s representatives from the Gulf Coast district branches. The 3-day meeting was held in Houston. The men received reports on the company's current research activities, new tools, instruments, and techniques recently developed for logging and perforating oil wells.

Baumgardner Promoted by Weatherford Oil Tool Co.

Clyde Baumgardner has been promoted to assistant division manager of the headquarters area and export division in Houston, Tex. He was moved to Houston from Casper, Wyo., this past summer as a sales and service engineer. He has been with Weatherford since July 1952.

Frank Black Becomes Delta Tank Branch Manager

F. M. BLACK

Appointment of Frank M. Black as Houston-area branch manager of Delta Tank & Mfg. Co., Inc.'s, oil-field equipment division was announced by Ross B. Baze, vice president. Black worked for Humble Oil & Refining Co. in the production-research department before coming with Delta Tank. He has served with other equipment firms, also.

McCullough Tool Shifts Mitchell, Brown, and Cline

Jim Mitchell will manage the new service branch at Andrews, Tex., for McCullough Tool Co. T. O. (Tim) Brown is sales engineer at the new branch. C. J. Cline has been promoted to sales engineer at Wichita Falls, Tex. O. J. McCullough, vice president, made the announcements.

Mitchell has been with the company for 8 years and was manager at Sherman, Tex. Brown came from the Odessa, Tex., branch and has been with McCullough for 3 years. Cline has been with the company for 4 years.

Worthington Appoints Hammond as Manager

E. W. HAMMOND

E. Weston Hammond has been appointed district manager for the Worthington Corp. Los Angeles district office. W. A. Meiter, general sales manager, made the announcement. Hammond was formerly assistant manager of the Los Angeles district office. He succeeds J. G. Murphy who has been appointed special representative.

Hammond joined Worthington in 1922 as a student engineer in the Buffalo division. Prior to his appointment as assistant manager of the Los Angeles district office in 1951, he served as distributor supervisor of the air-conditioning and refrigeration division.

Murphy served as district manager of the Los Angeles office since June 1930. He joined Worthington in 1920 as an application engineer.

Homco Appoints Stone To Export Division

Earl Stone has been appointed to the export division of Houston Oil Field Material Co., Inc. He was associated with the Chickasha Oil Co., Orbit Valve Co., and Edward Valves, Inc., before joining Homco. He will assist Bob Chadderdon in New York

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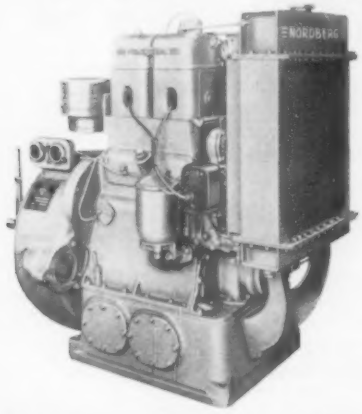

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In the low cost medium speed POWER CHIEF engines you get all the design, construction and fine quality that has made Nordberg engines famous throughout the world for over 50 years.

POWER CHIEF engines are so simple in design that they can be maintained, in the field, with only a few ordinary hand tools.

Such FEATURES as these make POWER CHIEF the best buy: Removable wet cylinder liners • Valves in head • Replaceable valve guides • Special alloy inserted exhaust seats • Positive full pressure lubrication • Internal ventilation bars entry of dirt • Crankcase and all other vital parts fully sealed • Oil heat exchangers maintain proper internal temperatures at all loads • Safety approved, enclosed heavy flywheel smooths out fluctuating loads • Fram oil filters • Vortox oil bath air cleaners • Wico & Bosch magnetos • Twin Disc clutches • Murphy safety shut-down devices • No extra added costs for these when you buy.

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in the sale of oil-field supplies; and directional drilling, fishing, and cutting tools.

Dresser Division Chooses Krueger and Cleland

William F. Krueger has been appointed manager of pipeline sales and M. C. Cleland has been appointed general markets sales representative. H. Z. Hight, sales manager for Dresser Mfg. Division, Dresser Industries, Inc., made the announcement.

Krueger will develop sales of new

W. F. KRUEGER

M. C. CLELAND

products for the pipeline industry. He has been with Sperry-Sun Well Surveying Co. for 18 years.

Cleland will cover Texas, Oklahoma, and Arkansas. He was director of procurement for the Universal Corp. before joining Dresser and had been with the Charles Wheatley Co.

Rector Well Equipment Co. Appoints Pinkerton to Staff

John R. Pinkerton has been appointed sales - service representative for Rector Well Equipment Co. J. L. Pinkard, sales manager, made the announcement. Pinkerton will have headquarters in Great Bend, Kans., and will cover Kansas and Oklahoma Panhandle. Before joining Rector he was office manager for Midwestern Drillers at Liberal, Kans. Prior to that he was with Bovaird Supply Co. at Liberal.

J. R. PINKERTON

Nalco Appoints Bell and Rodewald

Thomas R. Bell and William H. Rodewald have been added to National Aluminate Corp.'s technical service organization in southern California to serve as field representatives.

Eight water-treatment and oil-chemicals specialists, under the supervision of J. T. Nicholson, district manager, and C. W. Bonde, West Coast district manager of the firm's Ion Exchange Division, are now working out of Glendale headquarters.

Rodewald transferred from Nalco's main office in Chicago.

Schlumberger Appoints McCann and Stratton

D. C. McCann has been appointed president of Johnston Testers, a Schlumberger subsidiary, and Everett F. Stratton succeeds him as vice president of operations for Schlumberger Well Surveying Corp.

The appointments were announced by Pierre Schlumberger, president. M. O. Johnston, founder and former president of Johnston Testers, will continue to serve as chairman of the board.

Baroid Promotes Farnham and Hagstette

Baroid Division, National Lead Co., has made several organizational changes in line with the company's over-all expansion program. Harold H. Farnham

H. H. FARNHAM

E. J. HAGSTETTE

is appointed assistant to the general manager, project development. E. J. Hagstette, Jr., is appointed assistant to the general manager.

R. W. Wilson succeeds Farnham as manager, technical sales and operations. B. L. Boccella, area manager at Tulsa, will be directly in charge of all operations in the Mid-Continent area, including the Texas Panhandle. A new district has been created with headquarters at Liberal, Kans., with B. R. Fry as superintendent.

George Warren is appointed assistant area manager with headquarters at Tulsa. Warren Miller is appointed assistant area manager with headquarters in Great Bend, Kans. W. A. Ashweill, Jr., is made sales representative with headquarters in Tulsa. Roy Mitchell shifts as district sales representative with headquarters at Wichita, Kans.

C. M. Anderson and George C. Sims are appointed district sales representatives at Amarillo and Pampa, Tex. C. R. Hargrove and J. K. Meagher are appointed district sales representatives at Oklahoma City and Ardmore, Okla.

This announcement under no circumstances is to be construed as an offer of these securities for sale, or as an offer to buy, or as a solicitation of an offer to buy, any of these securities. The offer of these securities is made only by means of the Prospectus.

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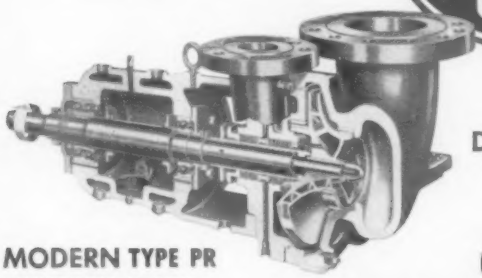

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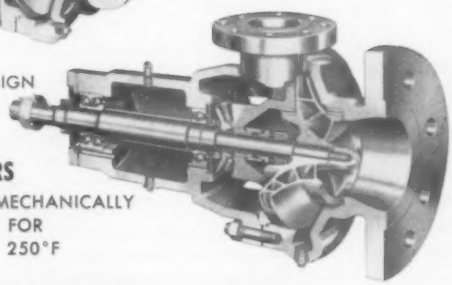

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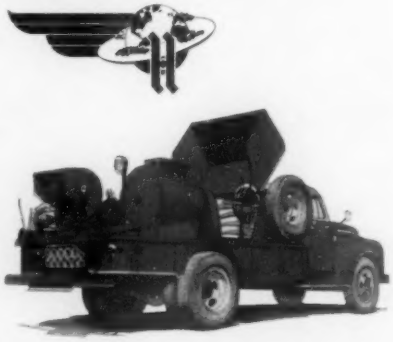

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Texas Takes a New Look at Its Oldest Fields

by Frank J. Gardner

The Texas Co. is drilling a 9,500-ft. wildcat in the center of Texas' oldest oil fields, the Corsicana-Powell area of Navarro County. The well has had an encouraging show in the Smackover-Jurassic at the 8,700-ft. level.

THERE'S a lot of oil yet to be found in East Texas. And by East Texas is meant anywhere east of Fort Worth and north of a line from Belton to Lufkin.

This belief was emphasized in 1956 by several discoveries; most important of these was the long-awaited opening of oil production on two of the region's piercement salt domes, but other less-heralded strikes also underscored the future prospects. The continued extension of the baffling Crane-Pettet dolomite trend astride the Texas-Louisiana border, and the cluster of fields found in Anderson County pointed up a lot of possibilities.

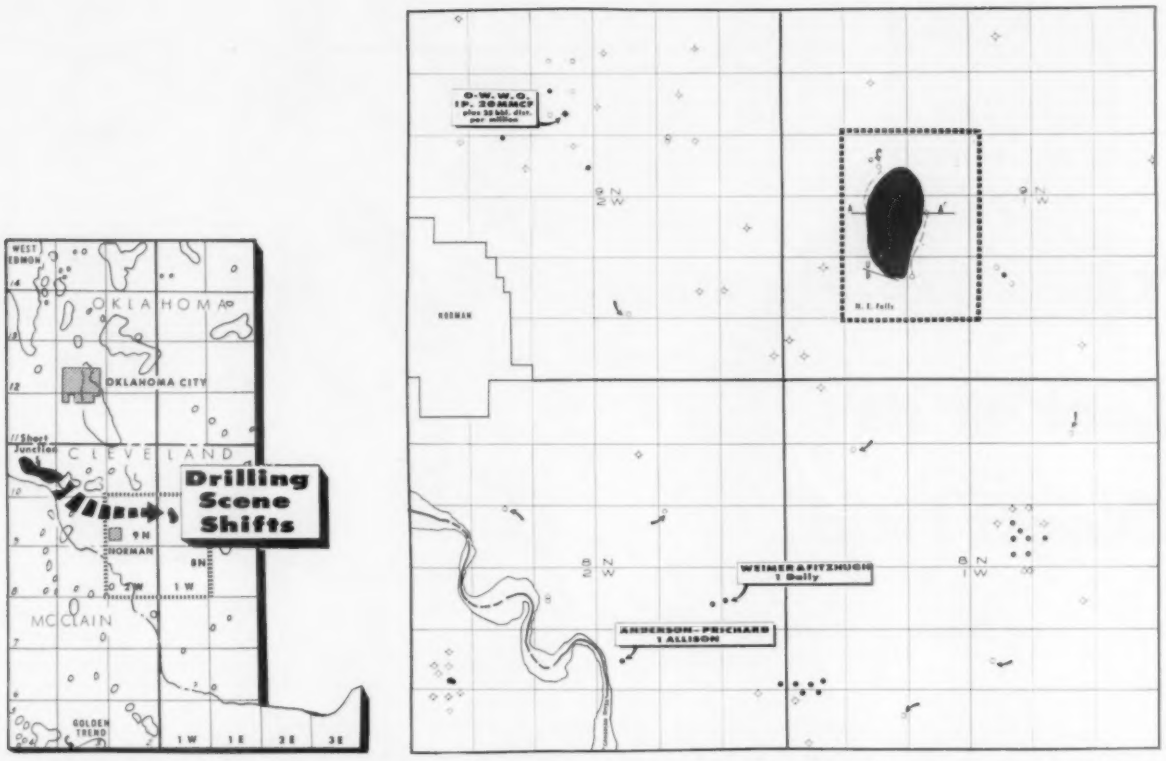
Five strikes . . . But a frustrating, and at the same time perhaps the most tantalizing lure to deep wildcats looking for "big oil" has been the erratic Jurassic-Smackover trend. Curving in a great arc from the northeastern tip of Texas west and south to Mexia is a 200-mile stretch of territory that should logically be stippled with producing Smackover fields. The score so far? Five strikes. Of these, one is at old Mexia field at the southern end of the trend, two are at its northeastern extremity (Eylau and Flower Acres in Bowie County), and two more in between, but nearer the northeastern terminus (Ginger in Rains County and New Hope in Franklin).

Humble Oil & Refining Co.'s Smackover discovery in the old Mexia field of Limestone County, in February 1955, set off a lively campaign of leasing all along the trend, which follows the so-called Luling-Mexia-Talco fault belt. But no more discoveries have been made, despite the drilling of a few wildcats in 1955 and 1956, and Humble's discovery well itself was a disappointment. It is now off production completely, after having produced 12,913 bbl. of oil; last reported production was in April 1956.

And four duds . . . What is the secret of the Smackover reservoir? What factors are essential to the existence of a commercial pool in this limestone enigma? Texas operators wish they knew. For if a chain of fields as good as the New Hope-Smackover field could be brought in all along the trend, East Texas would seethe with drilling activity again. Tidewater Oil Co. has had very good luck with its Smackover operations at New Hope; there, the production is sweet gas and condensate at 12,000 ft. in copious quantities. At Ginger, the sulfurous Smackover gas has deterred development of the 12,000-ft. reservoir. Flower Acres was a small gas-condensate well but it too was a disappointment. At Eylau, the only Smackover oil field, the discovery well was offset by four dry holes. Across the state line in North Louisiana and South Arkansas, the Smackover is one of the most prolific oil producers. There, it's a porous limestone. In Texas, it tightens up. Out in the center of the East Texas basin, little is known of it, but if it should prove to be an adequate reservoir rock there, it could hold tremendous amounts of undiscovered reserves.

Today, one more wildcat is probing the Smackover, and on trend. It has had some encouragement, if small. The Texas Co. 1 Edens, in James Smith Survey A-726, is coring Smackover near the 9,000-ft. mark, after having run two drill-stem tests in the formation. In the first one, a 13-minute test at 8,709-55 ft., operators had a flow of gas and condensate in undetermined volume, but pressure readings were 3,370 psi. flowing and 4,170 psi. shut in. A second test at 8,794-8,821 ft. had no shows.

Supply evidence only . . . This deep driller, contracted to 9,500 ft., is a rare venture. It is situated in the center of Texas' oldest producing area. The Corsicana-Powell fields have poured out more than 150 million barrels of oil since their initial discovery in 1896. This oil came from the shallow Navarro-Taylor and Woodbine sands of Upper Cretaceous age. But few wells in this region have penetrated below the Cretaceous. The 1 Edens is on direct trend with Humble's Mexia strike, and if Texaco is successful at Powell, perhaps the fire that flamed and died in 1955 will flare up again. But successful or not, the shows and flows from these two wells should be evidence enough to shrewd operators that there's a lot of oil yet to be found in East Texas.



WITH THE DECLINE in field drilling at Short Junction, operators are turning to wildcat drilling in the Norman area of central Oklahoma. Principal target is the Wilcox sand. Fig. 1. Arrowed wells denote current wildcats.

Drilling Perks Up in Central Oklahoma

by Norman S. Morrisey
Drilling-Development Editor

DISCOVERY of several small Wilcox fields near Norman, Okla., has triggered an intense wildcat drilling campaign for Cleveland County. The program has been gathering momentum steadily, but until recently was overshadowed completely by field drilling at Short Junction. Now, with the decrease in activity at Short Junction, the importance of the new drilling program is increasing.

Most recent discovery is the Anderson-Prichard Oil Corp. 1 Allison that flowed 301 bbl. of oil in 15½ hours through perforations in the Bromide sand at 7,900-05 ft. A deeper pay zone, the Tulip Creek, yielded 173 bbl. in 13 hours through perforations at 8,210-15 ft. Location of the new discovery is NE NE SW 27-8n-2w.

Tulsa operators, Weimer and Fitzhugh, stimulated the play by drilling the discovery well of Noble field, the 1 Daily (NW NW SW 24-8n-2w). The wildcat was completed as a second Wilcox producer for 381 bbl. per day from perforations between 7,890-95 ft. Since this discovery in March 1956, the field has added another producing zone, the Tulip Creek.

But Ordovician pays are not the only target. R. E. Hibbert, Houston independent, reworked a dry hole in 9-9n-2w and completed it for a Prue gas well. The test, worked over in early 1956 had a calculated open-flow potential of 20,000 M.c.f. of gas plus 25 bbl. of distillate per million.

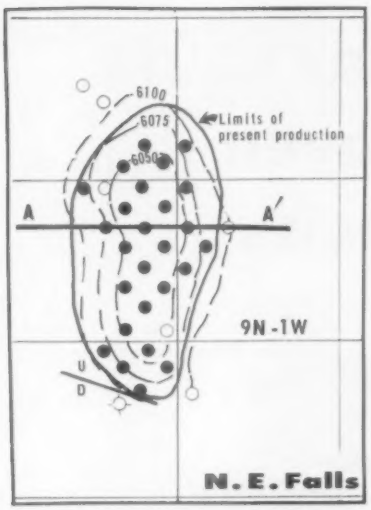
How big are these new fields? . . . Development drilling on the more recent discoveries has not reached the stage where their size can be forecast. However, a look at some of the producing areas will give a good indication of what to expect (Fig. 1).

Generally speaking, the Wilcox fields in this part of Cleveland County are small. The largest, Northeast Falls, covers less than a section. There are even one and two-well fields in the area. However, the Simpson sands are prolific and operators develop the fields on 20-acre spacing. Drilling depths to the top of the Simpson vary in the Norman area from 7,000 ft. in 8n-2w to only 6,600 ft. in 9n-1w.

Northeast Falls . . . Best discovery adjacent to Norman in recent years is Northeast Falls. The field is still being developed and the present proved area covers about 640 acres. Production is from the second Wilcox at drilling depths of 7,100-7,200 ft.

Northeast Falls is a small anticline with less than 100 ft. of relief. There is some evidence to indicate the presence of a fault at the south end of the field. An east-west cross-section shows the turnover (Fig. 3) and a preliminary map (Fig. 2) shows the present development.

Oil finding . . . Detailed seismic work is the key to success in the Norman



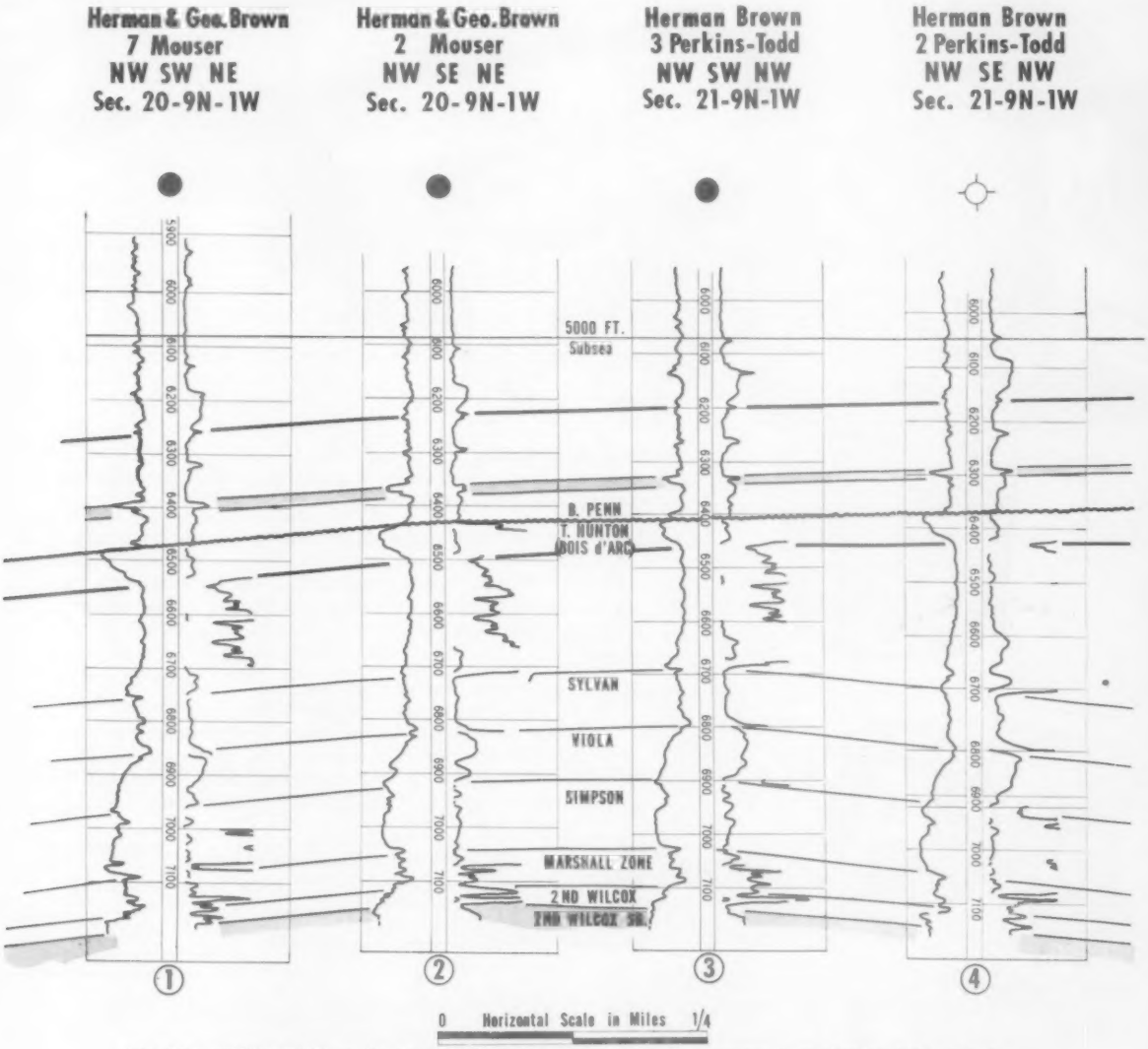
NORTHEAST FALLS is still being developed and is a small Wilcox field covering about one section. Fig. 2. (Wilcox datum.)

area, although locally there is enough well control to pin down a drillable prospect. However, it is difficult to map these structures with shooting, because the relief on several of the producing areas is under 50 ft. This fact does not dampen the enthusiasm of operators for Wilcox production. At present there are nine wildcats drilling in the four-township area shown in Fig. 1.

Drilling . . . The Norman area presents few drilling problems. The terrain is fairly flat and most locations are close to all-weather roads. Weimer and Fitzhugh drilled the 8,674-ft. discovery well at Noble in 44 days. Field wells at Northeast Falls to 7,200 ft. require under 25 days from spud to rig release. With the decrease in activity at Short Junction, competition for contracts is keen.

Emphasis shifts . . . Short Junction, unlike the Wilcox fields in the Norman area, is a strat trap and covers over 20 sections. At the present time the field is over 6 miles long, stretching in a northwest - southeast direction. Production at Short Junction bears little relationship to structure. The upper part of the Hunton limestone, the Bois d'Arc, is the reservoir. Oil migrating updip in this part of the Hunton was trapped against the overlying Pennsylvanian sands and shales to form the large-producing area. This field was rapidly developed.

The Bois d'Arc section is present in the Norman area but has not produced to date. Electric logs show 10-20 ft. of MicroLog pay in this section. Emphasis in the Norman area, however, is toward Wilcox reserves on small structures rather than strat-trap Hunton production. **End.**



WILCOX STRUCTURE at Northeast Falls is not apparent in the overlying Pennsylvanian beds. Fig. 3.

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EXPLORATION HIGHLIGHTS

EASTERN INTERIOR

ILLINOIS

Illinois Oil Production Higher in 1956

Estimated oil production in Illinois for 1956 is about 2,000,000 bbl. higher than for 1953, according to the State Geological Survey Division of the Department of Registration and Education. Estimated production for 1956 (final figures for November and December not yet available) is 83,062,000 bbl. In 1955 the state produced 81,131,000 bbl.

The number of wells drilled for oil and gas in 1956 was less than in 1955. During the first half of 1956, the drilling rate was above that for 1955, but the last few months of 1956 saw a decrease in drilling, which resulted in a total of 3,641 wells in 1956, as compared with 3,885 in 1955, the second highest year in Illinois oil history.

Drilling in 1956 was characterized by a large number of wildcat wells and an unusually small number of successful wildcats. Of the 3,641 wells drilled in 1956, 1,036 were wildcats. These discovered only 18 new pools and 81 extensions, or about 9 per cent successful. Corresponding figures for 1955 are 3,885 wells, including 856 wildcats which discovered 35 new pools and 85 extensions, or 14 per cent successful.

As a result of the development of Cooks Mills and Bourbon areas, Coles County had the largest number of wells completed in 1956. Douglas County, which had its first oil well drilled in 1955, ranked third in the state in total wells drilled in 1956. White and Wayne counties, which usually rank first and second, occupied second and fourth places.

No new pool was discovered in December, but 5 extensions to pools were completed: Chesterville in Douglas

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HOUSTON, TEXAS

WECO

Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

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County, Oakdale in Jefferson County, Fishhook in Pike County, Harco in Saline County, and Sumpter in White County.

Production for December was estimated at 7,412,000 bbl.

MID-CONTINENT

KANSAS

Lansing Discovery Seen At Graham County Well

Lansing production is indicated at an Imperial Oil of Kansas wildcat, the 1 Robinson in SW SW NE 17-9s-23w, 2 miles southwest of Brush Creek pool in Graham County.

Recovery on a drill-stem test at 3,692-3,709 ft. was 900 ft. clean oil. A test at 3,818-32 ft. got 3,100 ft. of oil.

Casing Run at New Harper County Strike

A New pool is indicated for northern Harper County. Skelly Oil Co. is running casing at its 1 Gish, SW SE SW 17-31s-6w, 3½ miles west of Runnymede pool and 3½ miles northwest of Harper.

A drill-stem test in the Mississippian at 4,340-65 ft. gaged 610 M.c.f. of gas daily. Recovery was 240 ft. of very heavily oil and gas-cut mud and 60 ft. salt water.

A drill-stem test in the Simpson at 4,698-4,708 ft. gaged 300 M.c.f. per day. Recovery was 610 ft. of free oil and 120 ft. very heavily-gas-cut mud.

OKLAHOMA

Woodward Discovery Area Confirmed

The confirmation well in the new Morrow producing area of Woodward County in northwestern Oklahoma has been assured production. Tidewater Oil Co. 1 Church, SE SE SW 11-22n-20w, flowed 3,638 M.c.f. of gas per day on 21/64-in. choke from perforations at 8,219-34 ft. on final test. Calculated open flow potential of the well is 4,650 M.c.f. daily. Distillate flow was 14 bbl. of fluid per million cubic feet, or about 65 bbl. daily, open flow calculation.

Offset to North Payne Is Dual Producer

The second well in new North Payne pool, McClain County, south-central Oklahoma, is a dual producer. The offset success is Weimer and Fitzhugh and Pyramid Oil Co. 1 Hanley Unit, NE SE NW 5-5n-3w. It flowed 20 bbl. of oil per hour on 20/64-in. choke from perforations in the Hunton lime at 9,055-85 ft.; from the Bromide sand at 10,240-45 ft. it flowed 16 bbl. hourly on ¼-in. choke.

Offset Staked for Second Blaine Well

The second test in new Northwest Okeene field, Blaine County's first producer, has been staked in C SW NE 15-19n-11w.

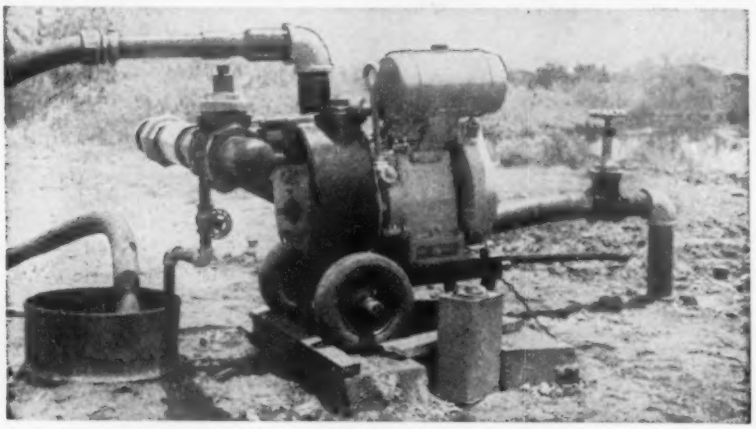
The new well is Perkins Brothers Production Co. 1 Brickman, a 7,800-ft. test. The discovery well in this new area was John W. Coyle, Jr., 1 Daugherty, SW SW SW 10-19n-11w. Completion flow was 3,050 M.c.f. of gas per day from perforations in the Chester-Mississippian at 7,486-7,562 ft. The well opened first production in this county.

HUGOTON EMBAYMENT

OKLAHOMA PANHANDLE

Testing Under Way At Beaver Discovery

Lynn Drilling Co. 1 Williams, SE SE NW 32-1n-20eCM, south of Cam-



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CONSTRUCTION MACHINERY COMPANY, Waterloo, Iowa

Pictured above & below, CMC Model 37-N on a typical oil field gathering operation.

rick field in Beaver County, swabbed oil at the rate of 19 bbl. per hour from perforations in the Morrow sand at 7,276-81 and 7,285-7,306 ft. and was shut in for tank space.

Northwest Highland field . . . Shell Oil Co. 1 Barby Unit, C NW SE 6-3n-28eCM, the confirmation well to new Northwest Highland field in Beaver County, flowed 4,580 M.c.f. of gas per day from the Hoover sand at 4,350-4,410 ft. on ¾-in. choke; earlier, the well tested 1,300 Mc.f. of gas per day from the Upper Chester-Mississippian at 7,185-95 ft. on ¾-in. choke, opening new production in the field.

Big Gas Well Completed At Grand Valley

A big gas well was completed in Texas County's Grand Valley field by Carter Oil Co. The 1 Jolliffe Estate, SE SE NW 4-2n-18eCM, had a calculated open flow of 110,400 M.c.f. per day from the Morrow sand at 6,246-78 and 6,286-93 ft.

NORTHWEST OKLAHOMA

Harper Tonkawa Discovery Completed for Oil

A new oil pool was opened southeast of Stockholm gas field in Harper County. Eason Oil Co. and Wilcox Oil Co. et al 1 Price, C NE SW 21-26n-23w, flowed 16 bbl. of oil hourly on 24/64-in. choke from perforations in the lower Tonkawa-Pennsylvanian sand at 5,490-92½ ft.

APPALACHIAN

OHIO

A north offset to production in the old Sego field in Madison Township, Perry County, resulted in a 140-bbl. well on 1 (2) J. T. Shaw, Section 16. Trentco Oil & Gas, the operator, reported the Clinton at 3,102-60 ft. with a fair showing natural.

- Pure Oil Co. 1 C. E. Miller, Section 2, Pike Township, Coshocton County, a ¼-mile east extension to West Carlisle pool, logged the Clinton at 3,274-3,324 ft. and gaged 32 bbl. in a 24-hour test after fracture.
- Mickley and Workman 4 (12) C. S. Banbury, a field well in Castle pool, was good for 315 bbl. in 24 hours after fracture. Clinton sand was found at 3,185-3,232 ft. and filled 2,000 ft. in 12 hours natural.

Ohio Yearly Summary

Development wells, principally in oil producing areas, were again the rule

This announcement is neither an offer to sell nor a solicitation of an offer to buy any of these Debentures. The offer is made only by the Prospectus.

$25,000,000

Interstate Oil Pipe Line Company

Thirty Year 4¼% Sinking Fund Debentures, Series Due 1987

Dated January 1, 1957 *Due January 1, 1987*

Interest payable January 1 and July 1 in New York City

Price 100% and Accrued Interest

Copies of the Prospectus may be obtained from only such of the undersigned as may legally offer these Debentures in compliance with the securities laws of the respective States.

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KUHN, LOEB & CO. *THE FIRST BOSTON CORPORATION*

HARRIMAN RIPLEY & CO. Incorporated *SMITH, BARNEY & CO.*

BLYTH & CO., INC. *GOLDMAN, SACHS & CO.* *LEHMAN BROTHERS*

STONE & WEBSTER SECURITIES CORPORATION *DREXEL & CO.*

WHITE, WELD & CO.

January 9, 1957.

These Notes are not being offered to the public.

$11,400,000

First Tanker Corporation

A subsidiary of Standard Oil Company (Indiana)

Notes, due 1973

The Company through the undersigned has entered into agreements for the sale of a maximum of $11,400,000 of its Notes to be delivered within specified times between December 26, 1956 and June 30, 1958.

MORGAN STANLEY & CO.

January 2, 1957.

for the year with wildcatting being held to a minimum. The large Corning grade fields in Knox, Licking, Coshocton, and Muskingum counties accounted for the majority of producers while efforts to develop the Pennsylvania Grade fields were scattered and limited. In northern Coshocton County wildcatting found oil and gas production both east and west of the field. Probably the most significant wildcat, located south of the old Wooster field in Wayne County, was completed as a combination well while development drilling near Gratiot and Walhonding was outstanding. Gas production was highlighted by a successful wildcat in southwestern Coshocton County and development wells in the Wayne-Summit-Stark County area.

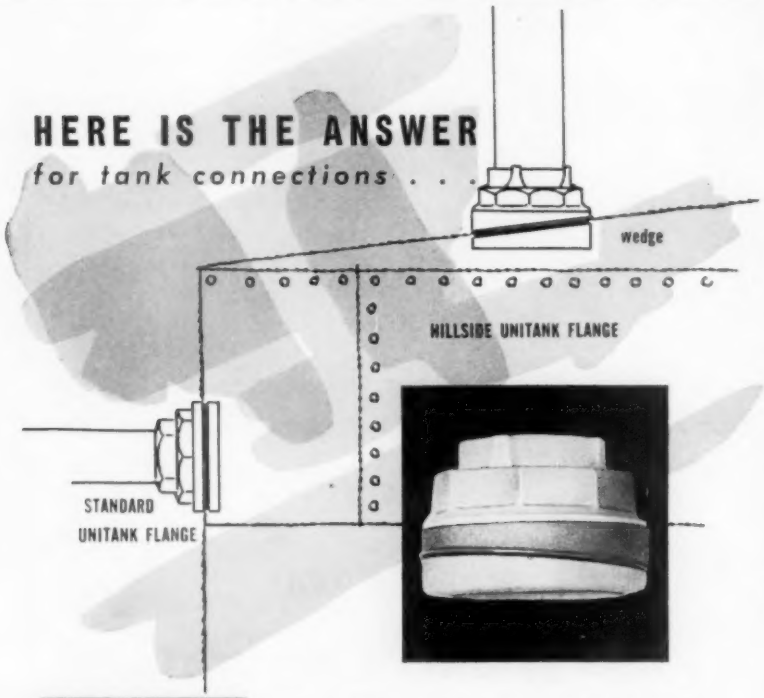
WEST VIRGINIA

In Dry Fork district, Randolph County, West Virginia, Nelson W. Taylor, Agt., completed 1 H. R. Tingler, wildcat, elevation 2,914 ft., with a final open flow of gas gaging 242,000 cu. ft., after fracturing the second time. The chert was 5,898-6,004 ft., Oriskany sand 6,051-6,229 ft., gas 6,114 and 6,185-90 ft., total depth 6,276 ft.

Columbian Carbon Co. 1239 U.S.A. Department of Interior, elevation 3,448 ft., is drilling in the Oriskany sand at 5,442 ft. The top of this formation was at 5,300 ft., with gas at 5,429-35 ft., testing 3,912,000 cu. ft.

EASTERN KENTUCKY

In Knott County an old well drilled deeper has failed to encounter commercial production and will be abandoned. United Fuel Gas Co. 5762 Lindsay Amburgey was drilled from an OTD of 3,207 to 4,100 ft. Devonian shale was logged from 3,207 to 3,326 ft., Corniferous lime 3,326 to 3,700 ft. and Silurian Clinton sand 4,035 to 4,100 ft. A small show of sulfur gas was had at 3,527 ft. in the Corniferous section.



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ENARDO manufacturing company
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ROCKY MOUNTAIN

NORTH DAKOTA

Heath Discovery Finaled in Billings

The year's first significant discovery in the Williston basin has been completed by Northern Pump Co. The 1 Fritz, SE SE 15-137n-100w, Billings County, flowed oil at the rate of 1,224 bbl. per day on a 7-hour test of perforations in the Heath sand at 8,055-72 ft.

This is the best Heath well in the Williston basin. Nearest production is Fryburg field, 12½ miles north. The only two areas in the basin producing from the Heath-upper Mississippian are Belfield and Fryburg fields in North Dakota. The Fritz success should stimulate renewed wildcat interest in western North Dakota counties.

MONTANA

Tange Discovery Finaled In Sheridan County

The 1 Tange Silurian discovery, the highlight of late 1956 exploratory news in the Williston basin and the entire Rocky Mountain province, was completed officially last week by Amerada Petroleum Corp.

The well flowed 2,742 bbl. of oil daily on ½-in. choke from perforations in the Silurian at 9,056-74 ft. Location is in C NE SE 20-36n-53e, Sheridan County. It is 1½ miles south of Outlook, Mont., and 29 miles from production at Northeast Bredette field. The 1 Tange and the 1 Fritz in North Dakota are perhaps the most significant discoveries in the Williston basin since Beaver Lodge.

Mission Canyon Well Completed at Cabin Creek

The second well in Cabin Creek field, Fallon County, to produce from the Mission Canyon - Mississippian is Shell Oil Co. M-21-33 Unit, C NE NW 33-10n-58e. The well flowed 226 bbl. of oil and 10 bbl. of water per day on 10/64-in. choke from perforations at 7,330-7,408 ft.

Late last year the discovery well of this pay, Shell M-42-29 Unit, C SE NE 29-10n-58e, flowed 305 bbl. of oil and 37 bbl. of water per day on 11/64-in. choke from perforations at 7,298-7,324 ft.

COLORADO

"D" Sand Discovery In Washington County

Washington County in the Denver basin has a new "D" sand producing area 2 miles west of Pleasant Valley. Cutlass Oil Co. and Calvert Drilling Co. completed the 1 Stoner in C SW SE 32-3n-53w, for 106 bbl. per day on 20/64-in. choke. Perforations are at 4,760-66 ft.

NORTHWEST NEW MEXICO

Shows Reported at Deep South Blanco Well

Oil and gas shows were reported on drill-stem tests at Skelly Oil Co. 6 Jicarilla "C," a deep test at South Blanco in SE NW SE 27-25n-5w, Rio Arriba County. The tests were in the Dakota at 7,016-50 ft. in an unidentified zone at 6,140-6,212 ft., and at 7,152-7,235 ft.

This well is ½ mile south of the Dakota gas discovery at 1 Jacarilla "C," SW NE SE 22-25n-5w, a 1956 discovery.

WESTERN NEBRASKA

Banner County Leads Denver Basin Race

Banner County leads the exploratory campaign in the Denver basin.

O'Donnell & Edmondson 1 Nagel, C NW NW 26-18n-55w, is reaming at 6,148 ft. This well is an east offset to 1 Snyder, a Miracle-Fifer Drilling Co. discovery in NE NE NE 27-18n-55w. The operator recovered 1,560 ft. of oil and 60 ft. mud-cut oil on drill-stem test at 6,163-80 ft., and is now installing pumping equipment.

These new prospects are south of Stauffer field. Sun Oil Co. has a discovery 1 mile east of the current drilling in Banner County at 1 Van Petl, C SE SE 23-18n-55w. Davis Oil Co. 1 Huffman, 4 miles southeast of the 1 Snyder well, is drilling below 5,780 ft. Stanolind Oil & Gas Co. has a well drilling below 450 ft. at 1 Wilkinson in C SE SE 29-17n-55w, 3 miles south of the 1 Huffman.

GREAT LAKES

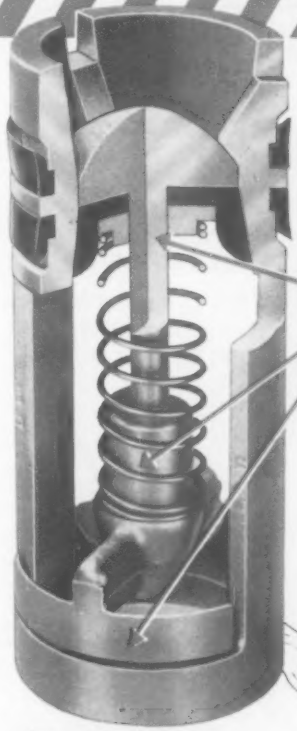
MICHIGAN

While Ford Oil Co. completed its new Colfax Township, Oceana County discovery well in Traverse lime, another potential discovery in Oceana County, appeared to have not responded satisfactorily to initial acid treatment, and additional testing and rework will be required.

Ford Oil Co. 1 Williams-Richmond Comm., SE SE NE 34-16n-15w, firm new west-state discovery, was being flowed at an average rate of 200 bbl. of oil a day through a 1/16-in. choke at 2,040 ft., total depth. First offset and follow-up to this new strike, Socony-Mobile Oil Co., Inc. 1 Packard, et al., NW SW NW 35-16n-15w, diagonal northeast 20-acre offset, was spudded this week.

The other wildcat well showing

The "WINNER" by a landslide!



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Traverse oil pay, drilled by McClure Oil Co. at the 1 State-Crystal, SE SE SW 7-16n-16w, Crystal Township, Oceana County, produced only about 2½ bbl. of oil a day on initial tests after a 460-gal. acid treatment in Traverse at 1,710 ft., total depth. Well pumped from 9 to 10 bbl. of oil natural on test. Operators, believing that tubing perforations might be plugged off, ordered rework at this wildcat. If well fails to show at expected production levels following clean-out, it may be deepened. Traverse lime was logged at 1,708 ft. Pay showed between 1,708-10 ft.

PACIFIC COAST

CALIFORNIA

Union Scores Again at Bardsdale

Union Oil Co. of California has added a deeper Pliocene pool discovery to its Bardsdale field production in Ventura County. Union recently completed 2 Berylwood in two zones, one of which was the new pool discovery. In addition to getting Pliocene production at the known interval 5,175-5,320 ft., Union drilled the test deeper and found the new pool at 7,820-8,498 ft. Initial production from the shallow (Santa Suzanna) pool was 450 bbl. daily of 34°-gravity crude and from the new deep pool (Berylwood) 346 bbl. daily of 28.4°-gravity crude. This well was the first offset to Union's original Pliocene discovery completed on the west edge of this old Venture County field last September. Both wells are drilled below the Oakridge Fault.

Superior and Texaco Keep Pace at Honor Rancho

Superior Oil Co. and The Texas Co. continued to keep pace with each other in the development of the prolific Southeast area of Honor Rancho field, Los Angeles County. Both recently brought in their third and fourth well respectively, within a day of each other. Texaco's well, 22 Honor Rancho, is the most westerly well in the play. It was completed in the interval 9,628-9,850 ft. for 1,168 bbl. daily of 38°-gravity crude. Superior's new well, 7 N.L.&F., was completed flowing 1,050 bbl. daily of 35.1°-gravity crude from 9,101-9,538 ft. The two wells are about ½ mile apart.

General Exploration Hits at Bandini

After repeated swabbings, General Petroleum Corp. brought in 24 C.W. O.D. in the Bandini field for a new Miocene sand discovery at 8,329-8,561 ft. Completion of this well gave this Los Angeles County field its deepest production. After swabbing, it flowed by heads at a 309 bbl. daily rate of 35.5°-gravity oil, 5 to 10 per cent cut.

WESTERN CANADA

SASKATCHEWAN

Details Released on Hitchcock Discovery

The three-company team headed by Husky Oil & Refining, Ltd., and including Consolidated Mic Mac Oils, Ltd., and Commonwealth Minerals, Ltd., who drilled a total of 23 exploratory wells on Canadian Superior Oil fo California, Ltd., farmout acreage in the southeastern sector of Saskatchewan last year, was rewarded with its sixth oil discovery in that project during the latter part of December. The well, on which information was held tight for a time to allow the drilling group to improve its acreage picture in the area, was drilled in the Hitchcock area near Bryant townsite, 8 miles north of Estevan and recorded success in the

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Charles zone of the Mississippian formation.

This discovery is known as, Husky-Mic Mac-Canadian Superior 1 Hitchcock, on LSD 4, 17-4-8w2, and is 3½ miles south-southeast of the closest previous driller, Shell A9-36 Bryant, an exploratory dry hole. Charles zone at the strike was contacted around the 5,000-ft. level and two tests which covered 50 ft. of the formation and the bottom 43 ft. of Charles zone gave up water-free oil recoveries, indicating a better than average well for the area.

Under terms of the farmout agreement with Canadian Superior the team acquired 20,480 acres divided into 25 separate wildcat parcels with each parcel calling for the drilling of one well. The remaining two sites will be drilled in the spring thus fullfilling the complete farmout.

● Still in Southeast Saskatchewan, two wells drilled by Imperial Oil, Ltd., approximately 40 and 65 miles east respectively from the previously announced Husky strike, were indicated by that firm as having good prospects for commercial production during the past 7 days. One of the wells, in the Oxbow area of the province, gave up its oil showings during drill-stem test operations carried out in the Midale, or porous zone of the Charles; while the other test, near Carievale townsite, 25 miles east of the Oxbow venture chalked up its discovery from the Mission Canyon sector of the Mississippian.

Imperial 9-27 Oxbow, LSD 9, 27-3-2w2, lies 2 miles northwest of a previous Imperial strike, and is 12 miles east of production in Frobisher field. During two drill-stem tests carried out in the discovery horizon, and covering an 80-ft. interval below 4,300 ft. pipe recoveries of oil-cut mud with traces of salt water were given up. Production tests are currently being carried out on the well in an effort to complete it commercially.

The other strike by Imperial 16A-27 Carievale, on LSD 16, 27-2-31w1, is 3 miles northwest of oil production in Gainsborough field and about the same distance north-northeast of the Imperial 5-16 Carievale exploratory abandonment.

A series of seven drill-stems were conducted on this hole in the Mission Canyon and took in a total of 86 ft. of that zone which was encountered around 3,620 ft. A good oil zone was indicated when best drill-stem test run midway in the zone gave up a pipe recovery of 2,580 ft. of light-gravity oil along with some oil-cut mud and salt water. Production casing has been set at the well and the firm is preparing to move a service rig to location in an effort to complete it as an oil well.

ALBERTA

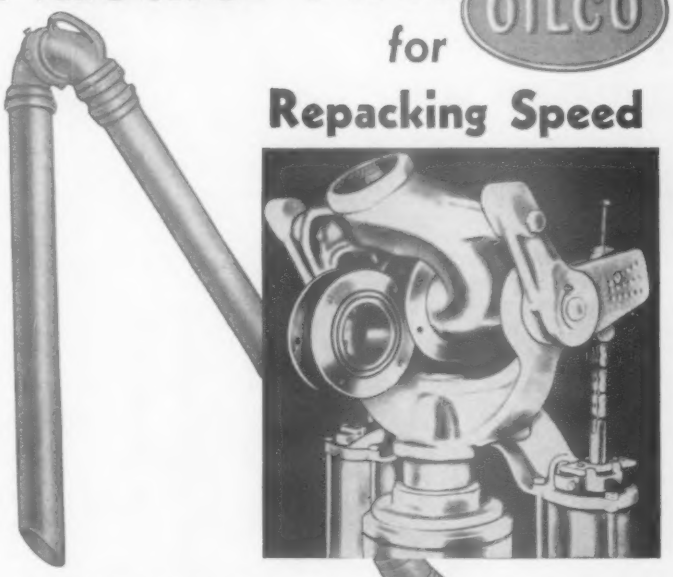
Gas Flows at Kaybob Wildcat

Switching to Alberta, Hudson's Bay Oil & Gas Co., Ltd., apparently started the New Year on the right foot as its wildcat in the Kaybob area of this province was reported by officials of that company to have flowed gas at an apparent commercial rate from the basal Cretaceous formation. Actual flow rate on the well during a drill-stem test conducted in the discovery horizon was measured at 1,500 M.c.f. of gas per day. The well lies 50 miles north of Edson townsite and 22 miles northeast of Devonian gas production in the Whitecourt area.

The well, H.B. Union 1 East Kaybob, on LSD 6, 20-61-18w5, is 8 miles south-southwest of the Cal-Standard 5-35 Kaybob abandonment. Drill-stem test in the zone covered a 30-ft. interval below 6,750 ft. As well as the gas struck during the test there was a pipe recovery of gas-cut mud and salt water.

● British American Oil Co., Ltd., is reported from unofficial sources to have completed a commercial gas suc-

Another First for OILCO Repacking Speed



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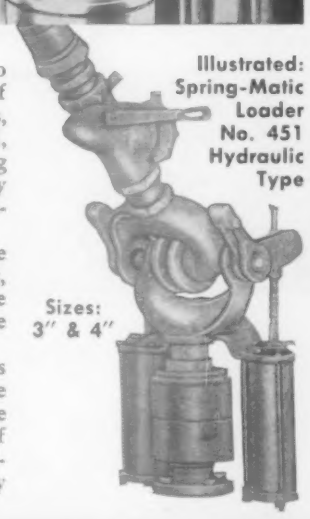
The illustration demonstrates the process: Remove the flange bolts, roll out the flange assembly, replace the seal, restore the bolts, and the job is done in a twinkling.

This successful swing joint employs three ball bearings — two for the radial load and the third for the thrust load. Perfect alignment of these three bearings insures maximum packing life and smooth, easy vertical movement of the loader.



Illustrated: Spring-Matic Loader No. 451 Hydraulic Type

Sizes: 3" & 4"

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cess from a depth of around 800 ft. in the Esther area of southeastern Alberta. This newest find for British American apparently flowed gas from the basal Belly River formation, or its equivalent for this part of the province, at a calculated open flow rate of 7,500 M.c.f. daily.

The well, British American-Sun-Canada Southern-Royalite 6-32 Esther, on LSD 6, 32-31-2w4, is located approximately 30 miles north of gas production in the Suffield area and is on acreage acquired from the team of Sun Oil Co., Ltd., Canada Southern Oils, Ltd., and Royalite Oil Co. Total depth of the venture was reported as 2,740 ft. and 7-in. production casing is set at 955 ft. For production test an 8-ft. interval around the 800-ft. level was opened up. Actual production through a restricted choke was over 2,000,000 cu. ft. per day with the open flow being calculated from that.

WEST TEXAS-NEW MEXICO

WEST CENTRAL TEXAS

Stonewall Extension Flows

New Seven Falls Oil Co., operator, and Sunray Mid-Continent Oil Co. 1 Bilberry has extended production ½ mile west of Gloria Gay pool in Stonewall County. The new producer flowed at the rate of 280 bbl. of oil a day through 12/64-in. choke, from perforations at 6,129-33 ft.; in the Bend conglomerate. Tubing pressure was 190 psi. Location of 1 Bilberry is in 139-D-H&TC Survey.

In Jones County, So-Lo-Tex Petroleum Corp. 1 S. J. Winter, has been recompleted as a Tannehill discovery. On recompletion, the well made a daily potential of 77 bbl. of oil from perforations at 2,067-77 ft. Old total depth was 2,175 ft. Location is in Section 135, D. T. Bruce Survey, 9 miles northwest of Abilene, and east of Wimberly field.

Tannehill Sand Opener Northwest of Goree

Fletcher Oil & Gas Drilling Corp., Dallas, last week completed its first Tannehill sand well as a discovery 1½ miles northwest of Goree in Knox County. The well is 1 W. L. Moore, Section 100, Block 45, H&TC Survey. Pumping potential was 85 bbl. a day, from pay at 1,908-10 ft. Location is 2 miles northwest of present production.

Fletcher's well was completed in the lower Tannehill. An upper sand was logged at 1,800 ft., which was said to have had better shows than the deeper zone. Fletcher has six other active locations in the county.

Fisher Wildcat Flows Des Moines Oil

Shell Oil Co. 1 R. W. Callan, wildcat 8 miles southwest of Rotan, was assured of discovery production when it flowed 277 bbl. of oil the first 18½ hours of a 24-hour potential test. Flow was through ½-in. choke, from perforations between 6,235-56 ft. Location is in Section 4, Block 3, H&TC Survey.

SOUTHEAST NEW MEXICO

Tubb Prospect In Weir Area of Lea County

Continental Oil Co. 9 Britt B-15, deep test in the Weir area of Lea County, flowed oil and gas on a drill-stem test in the Tubb from 6,447-65 ft. Oil reached the surface in 17 minutes, at the rate of 13 bbl. an hour. Gas volume was 2,158 M.c.f. Flowing pressure was 1,365 psi.

A deeper test in the Tubb, at 6,600-34 ft., flowed a small volume of gas

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and recovered gas-cut mud. A 3-hour test in the Drinkard at 6,640-6,716 ft. also showed gas and recovered gas-cut mud. Operators drilled ahead. Location is in 15-20s-37e, 5 miles north of the town of Oil Center.

Chaves County Wildcat Is Completed

Charles P. Miller 1 S. M. State, wildcat in 20-4s-27e, 15 miles northwest of Kenna townsite, has been completed as a small Pennsylvanian gas-distillate discovery. Calculated potential was 1,852 M.c.f. of gas, plus 12 bbl. of distillate. Perforations were at 6,314-82 ft.

WEST TEXAS

Spraberry Strike in Northern Howard County

A Spraberry sand discovery was in prospect for Howard County at Forest Oil Corp. 1 Roy Minear, 13 miles north of Big Spring, and east of Luther, Southwest field.

A flow test on perforations at 6,311½-33½ ft. after washing the section with mud acid, produced 22 bbl. of new oil, plus the load, in 3 hours and 20 minutes. After a second acid treatment, the well flowed 113.79 bbl. of 32° oil, cut 1 per cent with water, in 4½ hours through open tubing. Location is in 24-31-T2N-T&P Survey.

Another Fusselman well has been added to the new area south of Big Spring multipay field in central Howard County. Williamson and Alstrin 1 Anderson, in 24-32-T1N-T&P Survey, completed for a daily potential of 212 bbl. of 50° oil through ¼-in. choke, from open hole at 9,564-74 ft. Gas-oil ratio was 722:1.

Location of 1 Anderson is ⅝ mile south of Williamson et al 1 Buchanan, which was a 1½-mile south extension to Fusselman production in Big Spring field.

Delaware Basin Test Has Resumed Testing

After a long run of deep-hole difficulties, Shell Oil Co. 1-17-A- University Delaware basin wildcat 5 miles southwest of Wink in Winkler County, has resumed testing.

On a drill-stem test at 15,142-84 ft., not identified, maximum gas flow was at the rate of 459,000 cu. ft. daily. Recovery in 2 hours was 60 ft. of gas and water-cut oil, 720 ft. of gas and oil-cut water blanket, 1,170 ft. of mud, gas and oil-cut water blanket, and 60 ft. of gas and oil-cut mud.

The well was drilled to 17,410 ft. Plugged back depth at this report was 15,225 ft. Formation tops are: Pennsylvanian lime 13,460 ft., minus 10,-682 ft.; upper Mississippian 15,675 ft., Mississippian lime 16,120 ft., and Woodford shale at 16,745 ft. by samples.

Ellenburger Oil East Of Block 39 Field

Ellenburger production has been opened just east of Block 39 field, depleted Ellenburger field in northeastern Crockett County. The new well is Stanolind Oil & Gas Co. 1 University CT, in Section 12, Block 39. Top of the Ellenburger was 8,140 ft. and pumping potential was 73 bbl. of 39° oil a day. Stanolind has full interest in the well, and 1,600 acres in the area.

Devonian Opener in Yoakum County Flows Oil

Western Yoakum County gained another Devonian strike in Caroline Hunt Sands 1 Nancy Sanderson Neals, 8 miles west of Plains. After washing

For many years Otis Bottom Hole Chokes have been used as standard procedure to plug or choke the flow at any desired rate and depth in the tubing string. Otis Bottom Hole Chokes prevent freezing of surface controls by moving the point of pressure and temperature reduction to the lower portion of the well bore. The tool also maintains a constant bottom hole pressure, which tends to stabilize and hold the water-oil content consistent

OTIS BOTTOM HOLE CHOKES

and retard water encroachment. Many high-pressure production problems have been easily solved through the use of this and other Otis sub-surface controls.

If your plans call for the completion or workover of a high-pressure oil or gas well in the near future, ask an Otis representative to outline the many advantages of Otis Bottom Hole Chokes. A call to your nearest Otis office will bring you complete details and a competent recommendation as to the type of controls for your specific well conditions.

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Devonian perforations at 11,929-37 ft. with mud acid, the well kicked off and flowed acid residue and load oil. When the load was recovered, it tanked 132 bbl. of new oil in 7 hours through 13/64-in. choke. Flowing tubing pressure was 500 psi. and estimated gas-oil ratio was 200:1.

Operators drilled into the Devonian at 11,920 ft., by samples, or minus 8,160 ft. Location is in Section 398, Block D, J. H. Gibson Survey. Tidewater, Gulf and Stanolind also own offsetting leases.

SOUTH TEXAS

TEXAS GULF COAST

Extension Helps to Close Bammel-North Aldine Gap

J. M. Huber Corp. and Ginther, Warren & Ginther, joint operators, have an extension discovery in the Bammel-North Aldine area, in northern Harris County.

It is in their 1 Dwyer & Taub Estate, 3 miles southwest of Westfield, which flowed at the rate of 51.59 bbl. of 31.6°-gravity oil per day through ⅛-in. choke from Yegua sand, perforated at 6,497-6,500 ft.

Location is about a mile southeast of production at Bammel, and about the same distance northwest of North Aldine.

McFaddin Beach Prospect Produces in Offshore Well

The old McFaddin Beach prospect on the coast of Jefferson County got its first commercial production last week.

Discovery well, drilled by Stanolind Oil & Gas Co., is on the south flank of the prospect, extending under the Gulf of Mexico.

Its location, on State Lease 41153,

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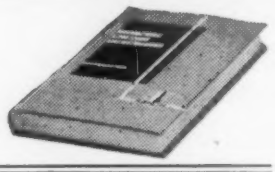

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Professor of Geology, Geological Institute of University of Leiden, Holland

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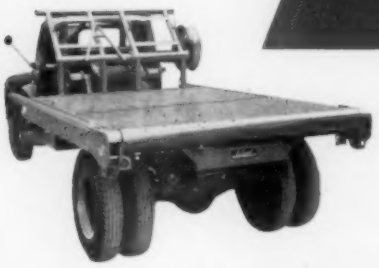

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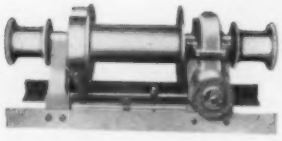

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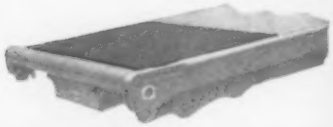

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in Small Tract 84, is 2 miles from shore. Its completion gives Texas its eighth field with production in the Gulf of Mexico.

Production is from casing-perforated interval at 6,510-30 ft. in hole drilled to 6,741 ft. Completion gage was 267.96 bbl. of 35.3°-gravity oil per day, testing through 5/32-in. choke. Flow was with pressure of 1,150 psi. and gas-oil ratio of 518 cu. ft. per barrel.

McFaddin Beach is about 7½ miles east of High Island, and about 20 miles west of Sabine Pass. It has been a recognized prospect since early in the 1930's.

Newton County Discovery Uncovers Yegua Production

Yegua production has been opened in a wildcat 2 miles northeast of Sabine Tram field, in Newton County. It is 7 miles east of Buna.

Discovery well, 1-B Earl Hankamer, drilled by Slick Oil Corp. and Kilroy Co. of Texas, joint operators, got a potential rating of 120.98 bbl. of oil per day, flowing through 7/64-in. choke.

Flow was under pressure of 1,390 psi. Gas-oil ratio measured 959 cu. ft. per barrel. Gravity of the oil is 43.6°.

Pay is perforated at 7,788-95 ft. Operators drilled to 8,580 ft. before electing to complete in this zone, one of several indicated.

Drilling is under way at a confirmation attempt, 2-B Hankamer, 933 ft. northwest of the discovery.

Live Oak County Gets Gas-Condensate Strike

Texam Oil Corp., operating in conjunction with Mayfair Minerals, and Armstrong & Horn Drilling Co., has uncovered a promising gas-condensate field in western Live Oak County.

Discovery well, 2 Sangar, is productive from the Slick member of the Wilcox formation, perforated at 6,904-78 ft. Calculated open-flow potential was 12,400,000 cu. ft. of gas per day. Gas showed 18.07 bbl. of condensate per 1,000,000 cu. ft. Pressure through ¼-in. choke was 2,024 psi. Shut-in pressure is 2,421 psi.

The area is about 12 miles southwest of George West, and about 2 miles from the McMullen County line.

Refugio County Discovery Opens Frio Sand Field

Stanolind Oil & Gas Co. reports a new-field discovery 8 miles southeast of Refugio, in Refugio County. Its 1 El Oso Cattle Co., in Day Land &

Cattle Co. Survey, found production in Frio sand topped at 5,496 ft.

The well flowed 136 bbl. of 33°-gravity oil per day, with no water, on 9/64-in. choke. Gas-oil ratio is 467 cu. ft. per barrel. It had been drilled to 6,215 ft. and plugged back to 6,103 ft.

The producing zone, which indicated 10 ft. of net pay, was perforated from 5,496-5,502 ft.

Stanolind and El Oso Cattle Co. each own one-half interest in the well and in 1,145 acres around it.

Location is about 1 mile east of Woodsboro field, and about 2 miles south of Mary Ellen O'Connor field.

New Trans-Tex Gasser Extends Catahoula Pay

Catahoula production in Trans-Tex field, Wharton County, is being extended into a fault segment which previously has produced only from other horizons.

The extension is by Associated Oil & Gas Co. at its 2 Wallace. Its Catahoula pay is perforated at 3,011-18 ft. When tested through ¼-in. choke, the well flowed 2,000,000 cu. ft. of dry gas per day under pressure of 1,183 psi. Its indicated absolute open-flow potential is 7,200,000 cu. ft. per day.

This is Associated's eighth well in the field, where the company has leases totalling 2,370 acres.

SOUTHWEST TEXAS

Long-Extension Test at East Alta Mesa Produces

Standard Oil Co. of Texas has completed a gas-condensate producer in a wildcat 2 miles southwest of its East Alta Mesa field, in Brooks County.

The well, 2 Braulia de Garcia 5, tested 1,250,000 cu. ft. of gas daily from a Vicksburg pay at 7,767-77 ft. Gas carried 50 bbl. of condensate per 1,000,000 cu. ft. of gas.

Hole had been drilled to 8,500 ft. Previous deepest production in the East Alta Mesa area, discovered in 1944, has been in a 7,400-ft. zone. The extension and deeper pay well was drilled to 8,500 ft.

The area is about 12 miles east of Rachal. Nearest production in the original Alta Mesa field, discovered in 1926, is about 3 miles northwest.

Jaboncillos Field Grows

Sunray Mid-Continent Oil Co. has extended productive limits of Jaboncillos field, in Duval County, 3,000 ft. southward at its 2 Saenz, completed with a flow rate of 146 bbl. of oil per day through ¼-in. choke from Frio sand at 3,052-67 ft.

ARK-LA-TEX

EAST TEXAS

Distillate Well Is First East Texas Strike of Year

Humble Oil & Refining Co. 1 South Chandler Unit has been completed as a distillate discovery, and the first 1957 pool opener.

Location of the new well is in the Eli Hillhouse Survey, A-283, 5 miles south of Chandler in Henderson County. Initial potential was 142 bbl. of 53° oil a day through ¼-in. choke, with gas-oil ratio of 5,280:1 and tubing pressure of 1,000 psi.

Pay section is the Rodessa, perforated at intervals from 9,441-48, 9,477-84 and 9,493-99 ft. Total depth was 10,634 ft. Humble holds north, east and south offsets. Proposed new field name is South Chandler.

SOUTH LOUISIANA

Happytown Well Makes Dual-Zone Completion

Howell, Holloway & Howell have made a dual-zone completion in their

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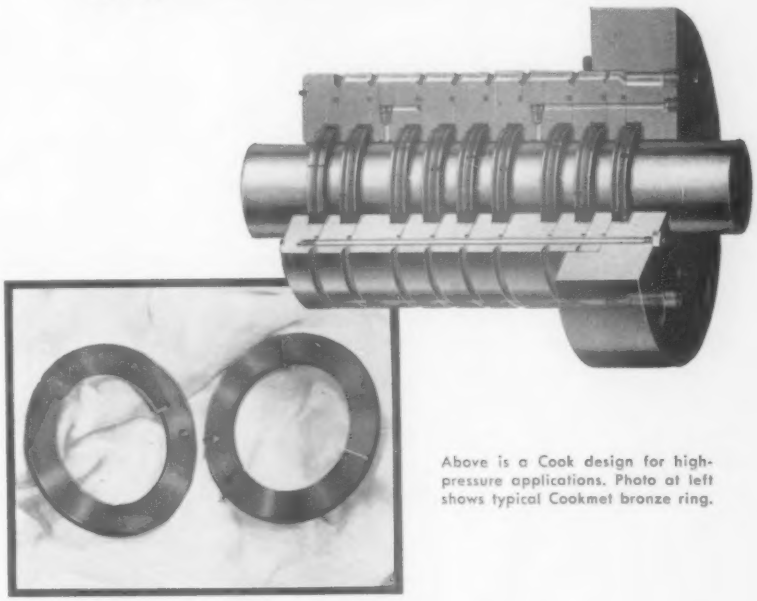

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2 Iberville, at Happytown, in St. Martin Parish. Location is on the south flank of the field.

The well was drilled to a total depth of 10,896 ft. Upper pay is perforated at 10,468-76 ft., and lower zone at 10,894-82 ft.

Flow from each zone was at the rate of 4,400,000 cu. ft. of gas per day through ¼-in. choke. Pressure was 3,100 psi. Gas sprayed condensate.

LOUISIANA GULF COAST

Dave Haas Field Spreads

Atlantic Refining Co. has extended Dave Haas field, in Avoyelles Parish, one-half mile northwest with a Wilcox well making 130 bbl. of 42.1°-gravity oil per day 11/64-in. choke. The well, 19 Haas, had flowing pressure of 675 psi., and gas-oil ratio of 1,018 cu. ft. per barrel. Its pay is perforated at 8,562-74 ft.

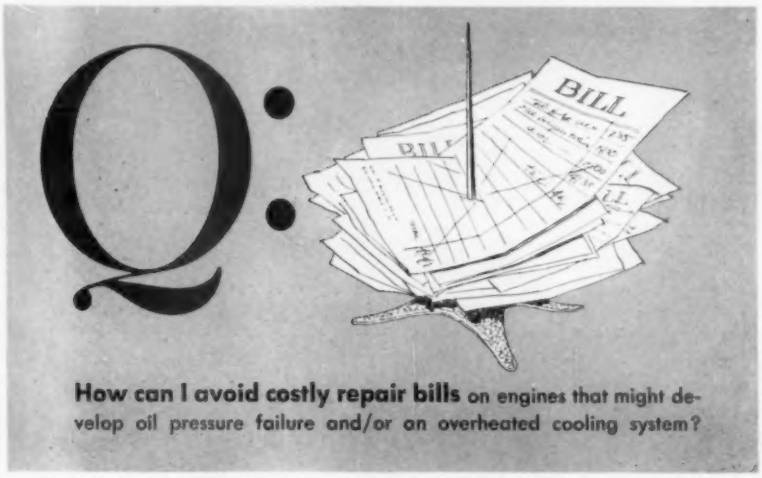
Second Zone Produces in Timbalier Bay Discovery

Union Oil Co. of California has dually completed its deep discovery well, 2 miles east of the big Caillou Island field at the mouth of Timbalier Bay, in Terrebonne Parish.

The well, drilled to 15,015 ft., first was completed several weeks ago from casing-perforated interval at 11,938-48 ft., from which it flowed at the rate of 160 bbl. of 35°-gravity oil daily through 5/32-in. choke.

Latest completion is in a slightly shallower zone, perforated at 11,834-44 ft., from which flow was at the rate of 325 bbl. of 35.2°-gravity oil per day through 5/32-in. choke.

Gas-oil ratios are low—that of the deeper zone being 600 cu. ft. per barrel, and the other 846 cu. ft. per bbl.



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TEXAS GULF COAST

Jefferson County: Magnolia Petroleum Co. 10-A State, Tract 9, Gulf of Mexico. IP 250,000 M.c.f. daily, open-flow potential, perforations 8,530-48 ft. TD 9,198 ft. (New pay in High Island Block 10-L field.)

San Patricio County: Delhi Taylor Oil Corp. 1 Hayes, Block 8, George Morris Sur., A-19. IP 27.56 BOPD, 9/64-in., 27°, perforations 6,541-46 ft. TD 8,015 ft. (New field—Albertson.)

SOUTHWEST TEXAS

Starr County: Pure Oil Co. 1 Guerra, I&GN Sur 483, A-334. Shut-in gas well, no gage, perforations 3,406-12 ft. TD 4,402 ft. (New field.)

LOUISIANA GULF COAST

Plaquemines Parish: John W. Mecom and Freeport Sulphur Co. 46 E. Cockrell, Jr., et al, Township 19s-26e (north flank Lake Washington dome). IP 6,000 M.c.f. daily and 80 BCPD, ¼-in., 44.1°, perforations 15,419-29 ft. TD 15,902 ft. (New pay and extension at Lake Washington.)

St. Martin Parish: Kerr-McGee Oil Industries, Inc., 1-B Schwing, 3-11s-9e. IP 356 BOPD, 5/32-in., 45.5°, perforations 12,870-85 ft. TD 13,665 ft. (New field—Bayou Crook Chene.)

NEBRASKA

Cheyenne County: Baumgartner Oil Co. 1 Gaylord, C NE SW 20-17n-51w. IPP 85 BOPD, "J" sand discovery, new field. TD 5,335 ft. "J" sand.

MONTANA

Sheridan County: Amerada Petroleum Corp. 1 Tange, C NE SE 20-36n-53e. IPF 2,742 BOPD, ½-in. choke, Silurian discovery, new field. TD 9,950 ft. Red River.

WYOMING

Campbell County: Mobil Producing Co. F-44-1 G Government, SE SE 1-48n-69w. IPP 48 BOPD, Dakota discovery, new field. TD 6,917 ft.

COLORADO

Kiowa County: Continental Oil Co. 1 Lynn, C SE NW 13-20s-49w. IPP 240 BOPD, Marmaton discovery new pay. TD 4,992 ft. Mississippian.

WEST CENTRAL TEXAS

Shackelford County, William D. Austin 1 Dyer, 86-12-T&P, 12 miles N Baird. IP 308 BOPD, ½-in., TP 200 psi., 40°, GOR 600, Gardner sand 3,376-82 ft. TD 3,417 ft.

Taylor County: S. C. Herring Drilling Co. 1

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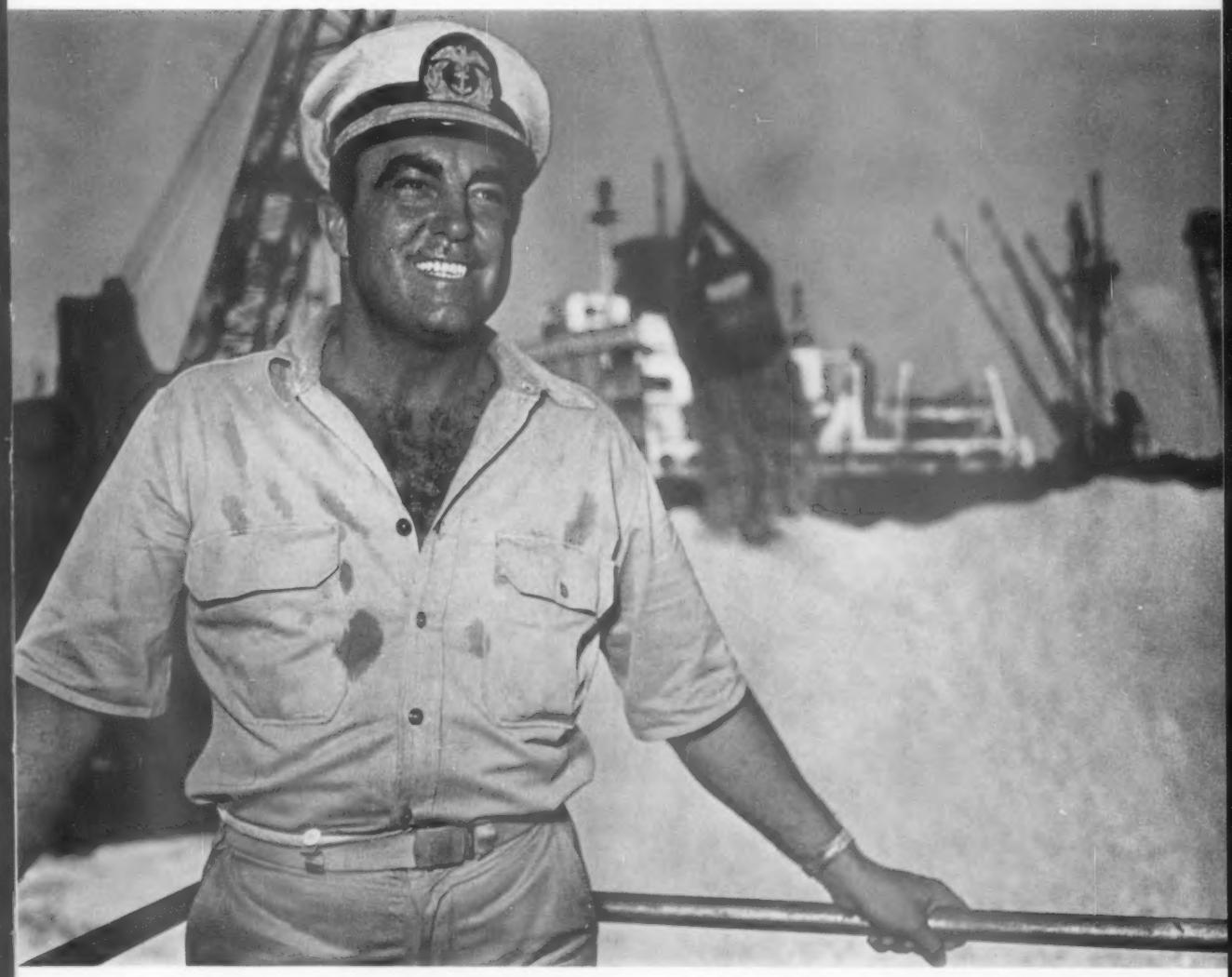

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Farr, John L. Smith Sur. 52, 2 miles SW Wylie. IP 44 BOPD, 14/64-in., TP 310 psi., 41°, GOR 820, Gardner sand 4,326-34 ft. TD 4,560 ft.

SOUTHEAST NEW MEXICO

Lea County: Tennessee Gas Transmission Co. 1-A State Kemnitz, NE NE 30-16s-34e. IP 412 BOPD, 28/64-in., TP 170 psi., GOR 1780, 40°, Pennsylvanian 10,742-80 ft. TD 11,537 ft., elev. 4,143 ft.

EAST TEXAS

Anderson County: Columbian Fuel Corp. 1 Southern Pine Lumber Co., G. W. Powell Sur., A-896, 8 miles E Slocum. IP 33 BOPD, 10/64-in., TP 275 psi., GOR 1212, 43°, pay 5,628-32 ft. TD 5,676 ft. Suggested name, Hickory Grove.

Harrison County: Amerada Petroleum Corp. 1 Frances White, Martin V. Lout Sur., 7 miles NW Marshall. IP 339 BOPD, 16/64-in., TP 775 psi., GOR 1575, 54°, perf. 6,957-69 ft. TD 7,214 ft.

WEST TEXAS

King County: Robert E. Aldrich 1 Ross, 96-13-H&TC, 8 miles SE Guthrie. IPP 72 BOPD, 36°, GOR 100, lower Tannehill 2,726-34 ft. TD 2,734 ft.

Pecos County: Gulf Oil Corp. 1 McDonald-State, 124-11-H&GN, 9 miles S Girvin. IP 527 BOPD, 18/64-in., TP 200 psi., GOR 1200, 35.6°, Wolfcamp 4,630-75 ft. TD 5,483 ft.

Schleicher County: R. H. Murray, Trustee 1 West, 78-A-HE&WT, 1¼ miles N Eldorado. IPP 42 BOPD, 41°, GOR zero, pay 2,194-2,200 ft. TD 2,460 ft.

Tom Green County: Miami Operating Co., Inc. 1 Dusek "B," M. Boden Sur. 101½, 6 miles E Wall. IP 205 BOPD, 16/64-in., TP 300 psi., GOR 247, 40°, Canyon sand 4,012-18 ft. TD 5,028 ft.

NORTH TEXAS

Baylor County: Robinson Drilling Co. et al 1 Criswell, Sec. 97, T&NO Sur., A-421, 7 mi. SE Bomarton. IP 24 BOPD, 16/64-in., TP 30 psi., 34°, GOR 500, Tannehill sand 1,294-1,300, 1,302-08 ft. TD 1,324 ft.

Jack County: Nash Oil Co. 1 Lewis, E. Moore Sur., A-287, 12 miles N Jacksboro. IP 245 BOPD, 16/64-in., TP 500 psi., 45°, GOR 1630, Caddo conglomerate 5,444-54 ft. TD 5,600 ft.

Knox County: Ajax Oil & Development Co. 1 Reed, Sec. 3, D. G. Burnett Sur. 7, A-15, 3½ miles NE Knox City. IP 225 BOPD, 20/64-in., TP 110 psi. 36°, GOR 150, Tannehill 2,090-2,100 ft. TD 2,376 ft.

Wise County: Ambassador Oil Corp. 1 Pruett, T. Denson Sur., A-239, 2 miles SE Boonsville. IP 83 BOPD, 16/64-in., TP 200 psi., 40°, GOR 281, perf. 3,090-3,110 ft. TD 6,114 ft.

Young County: Homer Maxey et al 1-A Hazelton, Sec. 89, James Rodgers Sur., A-1632, 9 miles SE Graham. IP 122 BOPD, 8/64-in., TP 650 psi., GOR 500, 41°, Glenna sand 3,169-79 ft. TD 4,033 ft.

F. D. Mueller 1 Pugh, D. F. McLendon Sur., A-1623, 9 miles S Graham. IPP 31 BOPD, 40°, GOR 350, pay 1,933 ft. TD 1,939 ft.

Warren Petroleum Corp. 1 Kay, TE&L Sur. 1930, A-1004, 4 miles SW Loving. IP 49 BOPD, 40/64-in., TP 35 psi., 37°, GOR 1885, conglomerate 4,553-61 ft. TD 5,004 ft.

CALIFORNIA

Ventura County: Union Oil Co. of California 2 Irwin Byrlwood, NE SW 12-3n-20w, 775 BOPD, two zones at 5,175-5,320 ft. and 7,820-8,498 ft., upper zone producing 34° gravity through 24/64-in. choke, lower zone producing 28.4° through 22/64-in. choke, TD 8,650 ft. (Deeper pool discovery at 7,820-8,498 ft. in Pliocene programed well drilled below Oakridge fault on west edge of Bardsdale field.)

MICHIGAN

Oceana County: Ford Oil Co. 1 Williams, Richmond, Comm., SE SE NE 34-16n-15w. IPF 250 BO in 15 hours. through 7/16-in. choke after acid, Traverse lime 2,026 ft., pay 2,032-40 ft., TD 2,040 ft. (New pool.)

WEST VIRGINIA

Randolph County, Dry Fork district: Nelson W. Taylor 1 H. R. Tingler, elevation 2,914 ft., 242,000 cu. ft. gas, after second fracture, chert 5,898-6,004 ft., Oriskany sand 6,051-6,229 ft., gas 6,114 and 6,185 ft. TD 6,276 ft.

Tucker County, Licking district: Hope Natural Gas Co. 10012 T. A. Loughrey, elevation 1,714 ft., 1,107,000 cu. ft., gas after second fracture, chert 3,902-4,086 ft., gas 3,920-46 ft., Oriskany sand 4,086 ft., gas 4,150-59 ft. TD 4,325 ft.

Mercer County, Plymouth district: Bluefield Gas Co. 1-100 Dee and Lola Bailey, elevation 2,513 ft., 26,000 cu. ft., gas after shot, Maxon sand, 1,680-1,820 ft., and 2,006-36 ft., gas 1,698-1,700 ft., and 1,716-37 ft. TD 2,036 ft.

OKLAHOMA

Tillman County: Mar-Tex Oil & Gas Co. 1 Wilson, C SW SW SW IPP 8 BOPD, Strawn sand 3,967-73 ft. TD 4,834 ft.

Garvin County: Superior Oil Co. et al 2 Akers Unit, SW 2-1n-3w. IPF 199 BOPD, Eola congl. 4,273-4,312 ft. TD 11,369 ft. New-pay discovery in Eola pool.

Stephens County: Magnolia Petroleum Co. 1 Oran W. Scott, C NW SE SE 14-2n-7w. IPP 152 BOPD, Hoxbar 8,344-8,566 ft. TD 9,015 ft.

Grady County: A. A. Cameron and Carter

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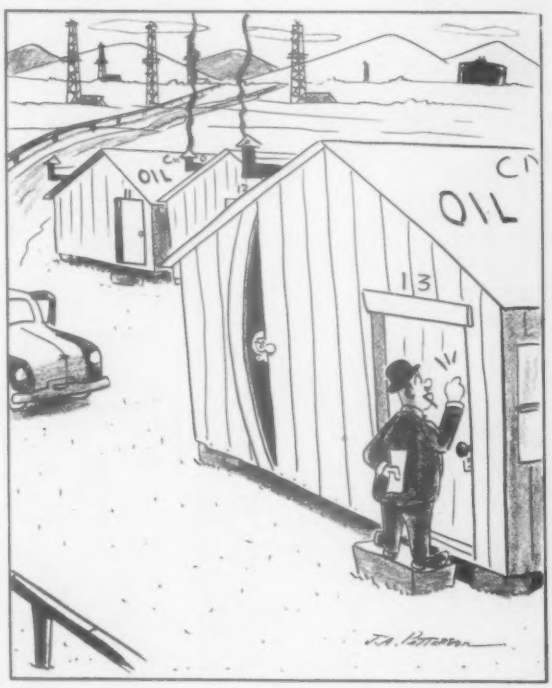

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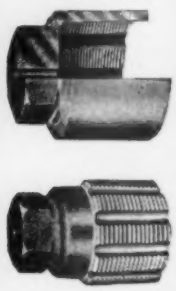

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SLUSH PUMPS

Oil Co. 1 Fedler Unit, C SE SW NW 31-3n-8w. IPF 401 BOPD, 2,500 M.c.f. of gas per day, Coline 6,727-57 ft.; first Rowe 7,137-56 ft. TD 7,905 ft. Rowe sand discovery in Burns pool.

Beaver County: Harper Oil Co. and Gulf Oil Corp. and Atlantic Refining Co. 1 Taylor, C NW SE 13-3n-24eCM. IPF 36 BDPD, 5,200 M.c.f. of gas per day, Morrow 7,528-36 ft. TD 7,700 ft. New pay discovery in Northwest Camp Creek field.

Cabot Carbon Co. and Eason Oil Co. 1 Ryser, C NE SW 9-3n-28eCM. IP 16,300 M.c.f. of gas per day, Hoover sand 4,450-83 ft. Chester 7,319-33 ft. TD 7,520 ft. New field.

Grady County: Frankfort Oil Co. 1 Burruss-Pyle, C SW SE IPF 1,056 BOPD, 2,392 M.c.f. of gas per day, Boatwright sand 10,578-96 ft. TD 10,811 ft.

Caddo County: Harry J. Schaefer 2 Cooke, NW NE 35-4n-9w. IPP 30 BOPD, Noble Olsen 3,646-56 ft. TD 10,033 ft.

Beaver County: Cities Service Oil Co. et al 1 Beard "A," C SW NE 8-5n-22eCM. IP 119,500 M.c.f. of gas per day, Morrow 6,305-26 ft., Chester 6,572-6,606, 6,630-64 ft. TD 6,712 ft. New pay (Chester) in South Greenough pool.

Texas et al 1 B. Hinkle Unit, 18-5n-24eCM. IP 5,010 M.c.f. of gas per day, Chester 6,396-6,406, 6,424-48, 6,471-75 ft. TD 6,667 ft. New pay in Forgan pool.

Kiowa County: W. E. Hulsizer and W. G. Smith 1 Fritz, 24-6n-15w. IPP 9 BOPD, granite wash 310-40 ft. TD 340 ft.

Beckham County: J. G. Beard, estate 1 Nancy Smith et al, C NE NE NW 24-8n-25w. IP 3,000 M.c.f. of gas per day, dolomite 1,872-1,960 ft. TD 2,029 ft.

Okfuskee County: George O. Folk 1-A Wetumka Bird-Douglas Unit, SW 33-10n-10e. IPP 10 BOPD, first Wewoka sand 298-312 ft. TD 540 ft. New pay in Wetumka pool.

Creek County: Russell Cobb, Jr., Inc. 1 Mandler, SE SE SW 5-14n-8e. IPP 1 BOPD, Skinner sand 2,522-25 ft. TD 2,534 ft.

Payne County: Pace Petroleum Co., Inc. 1 Virgil Cherry, SW NE SE 17-18n-5e. IPF 489 BOPD, Cleveland sand 2,540-90 ft. TD 2,618 ft.

Harper County: Cities Service and Gulf 1 McClung "A," NW NW SE 11-26n-25w. IP 110,500 M.c.f. of gas per day, Tonkawa 5,455-70 ft., Chester 6,945-66 ft. TD 7,200 ft. New pay in Laverne pool.

Keating Drilling Co. 1 Dunn, NW NW SE 22-28n-26w. IP 7,455 M.c.f. of gas per day, Morrow sand 6,364-72 ft. TD 6,633 ft.

ILLINOIS

Franklin County: Kewanee Oil Co. 1 Plains, SE SE NW 11-5s-2e. IPF 360 BOPD, Renault 2,673-96 ft. TD 3,284 ft. Extension and new pay in West Whittington pool.

Bond County: Stewart Producers 4 Donk Brothers "A," NW NW 33-6n-4w. IPP 5 BOPD, Penn. 598-612 ft. TD 612 ft. New pay in South Sorento pool.

Macoupin County: J. C. Nickerson 1 Hartke, NW SE NW 14-8n-6w. IPP 9 BOPD, Penn. 634-45 ft. TD 651 ft. Opens South Hornsby pool.

ARKANSAS

Ouachita County: David Crow, Tr. 1 Boyce, C SW NW 7-15s-19w. IPF 63 BOPD, Smackover 5,942-48 ft. TD 5,951 ft. New pay in Stephens pool.

Miller County: Carter Oil Co. 3 Philyaw, SEc 36-16s-27w. IPP 98 BOPD, Mooringsport 4,491-93 ft. TD 4,640 ft. New pay in Fouke pool.

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Texaco's Darling has found . . .

. . . Refinery Is a School for Men

STURGIS W. DARLING wanted a salesman's job when he went to work in 1923 at the Lockport, Ill., refinery of The Texas Co. He signed on as a pipefitter's helper until a selling spot opened.

But the intricate operations of the refinery so intrigued young Darling, he forgot about that selling job. Instead he carved out a career in processing and has never regretted it.

Darling recently capped a long string of responsible refinery jobs with Texaco by taking over as superintendent of the company's 35,000-bbl. daily West Tulsa refinery.

But Darling says he actually is still selling. "We're selling ideas here. The salesman sells only products."

Emphasis on men . . . That is Darling's way of expressing his philosophy of refinery management gained in 33 years of running Texaco refineries in various parts of the country.

"Many people don't realize that a refinery is more than a manufacturing plant.

"It's a great training ground for men—an industrial school," he says.

"Refining is unusual in one respect: In no other industry do so few men handle such expensive equipment. Our industry is at the top in dollar investment in equipment per worker. This puts a premium on good men, well trained for the job they are required to do."

That may explain Darling's concept of his job as a mixture of boss and school teacher. The Texaco plant management continually is operating on-the-job training programs for its workers and supervisors. Detailed information is assembled on the prospects and capabilities of workers with a view to moving them to more responsible jobs.

Darling put the problem this way: "Never before have we needed good men more than now. We not only need men of ability but just as important, men of sound character with qualities of leadership."

It pays off . . . Darling is a product of the training system he so proudly administers now.

When Darling came to Texaco, he had 2 years of college work at old Kingfisher College in Oklahoma. He was born in Checotah, Indian Territory, on April 1, 1902, and had attended schools in Oklahoma, Baton Rouge, La., and Natchez, Miss.

In 4 years at Lockport, Darling moved up from pipefitter's helper to stillman on the old shell-type crude stills used then. In 1927 he was picked to attend Texaco's first refinery department training course. It was a 6-week session held at the Port Arthur, Tex., plant, and was designed to train men for opening the company's El Paso, San Antonio, Amarillo, and Houston refineries.

After this training, Darling was sent to Dallas as assistant superintendent and in 1933 moved to Tulsa in a similar capacity. He became superintendent at the Amarillo works in 1934 and 2 years later was transferred to the top post at the Houston refinery.

Darling became superintendent of the Bayonne terminal in 1942, a spot he held for 9 years before going into Texaco's New York headquarters as assistant general superintendent of terminals in 1951. He was transferred to Lawrenceville, Ill., in 1955 as assistant superintendent for a refresher course in new processing techniques and then moved again to Tulsa in the boss job.

Many changes . . . The Tulsa refinery was practically a new plant from the small refinery Darling knew 23 years ago.

Darling is struck by two big improvements in the modern plant: Productivity of the workers and safety of the plant.

He believes the average worker individually is more productive now. This is due to improved facilities, better know-how, and wider abilities of the individuals. As for safety, there's no comparison, Darling says. The pressure equipment is much stronger, better designed, and better controlled.

"In the old days we didn't know when we left for work whether we'd come back in one piece. But today a serious accident is rare. The Tulsa plant alone has a million man hours without a time-lost accident and easily could go to two million."

Edwin Van den Bark, division manager for Phillips Petroleum Co. at Midland, Tex., has been promoted to manager of the southwest region with headquarters in Bartlesville, Okla. He succeeds **H. D. Brookby,** who was recently appointed manager of the company's foreign department. **C. F. Keller,** assistant division manager at Midland, will succeed Van den Bark as division manager. **A. M. Schiemenz,** division exploration geologist at Midland, has been promoted to assistant division manager and division exploration geologist there. **R. W. Barker,** district landman in Midland, has been named division landman.

Jack E. Fulgham, formerly plant foreman at Stanolind Oil & Gas Co.'s Sundown, Andrews, and Odessa, Tex., gasoline plants, has been appointed plant superintendent at the company's Kermit, Tex., Three Bar gasoline plant. He succeeds **Martin W. Bretz,** who has resigned.

J. Paul Fly, district petroleum engineer with Magnolia Petroleum Co. in Great Bend, Kans., has joined Gilcrease Oil Co. in San Antonio, Tex., as chief petroleum engineer.

Personals

Los Angeles Club Elects

J. C. Kelley, left, partner in the firm of Hillman-Kelley, has been elected president of the Petroleum Club of Los Angeles. He succeeds Olen Lane, right, vice president of Continental Oil Co. Other officers are T. H. Wallace, vice president, Western Gulf Oil Co.; Gordon D. Campbell, treasurer, General Petroleum Corp.; and Richard Sneddon, secretary, manager of the club.

Ray Harrison, district geologist in Bismarck, N. D., for Lion Oil Co., has joined Cardinal Drilling Co. in Bismarck as exploration manager.

Joe R. Mazzola, geologist with Gulf Oil Corp., has resigned to join Kingwood Oil Co., Denver, in the same capacity.

Dr. Werner F. Schneeberger, exploration manager of Anderson-Prichard Oil Corp.'s Rocky Mountain division, has joined Ball Associates, Denver, as head of foreign exploration.

K. C. Beresford, area geologist for Stanolind Oil & Gas Co. in Bismarck, N. D., has been transferred to the Casper, Wyo., division office. **G. B. Newton,** Casper division, will replace Beresford in Bismarck.

A. J. Head, director of Phillips Chemical Co.'s manufacturing division, has been promoted to manager of manufacturing divisions. **R. G. Rhodes,** manager of chemical manufacturing at Adams Terminal on the Houston ship channel, has been appointed director of plant operations for the company. **L. H. Johnstone,** assistant plant manager at Adams Terminal, will succeed Rhodes as plant manager there.

Marvin R. Carter, district engineer with Arkansas Fuel Oil Corp. in Olla, La., has been named district production engineer and transferred to Alice, Tex.

S. W. Clark, reservoir engineer with Shell Oil Co. in New Orleans, has been appointed division reservoir engineer in Hobbs, N. M.

Marvin Romberg, assistant manager of Carter Oil Co.'s geophysical division, Tulsa, has been appointed chief geophysicist. He succeeds **Dr. A. B. Bryan,** who has been attached to Carter's executive department on special assignment.

Charles F. Hunkins, manager of geology and engineering for Northern Pacific Railway Co., has been appointed assistant vice president of the oil development department. Hunkins joined Northern Pacific in 1952 as chief petroleum engineer.

John C. Price and **Henry H. Krusekopf, Jr.,** have opened consulting geological offices in Tyler, Tex. Price was formerly regional geologist in Shreveport, La., for Lion Oil Co. Krusekopf was district geologist for Pubco Petroleum Corp.

James W. Penn has been appointed geological engineer in Omaha for Northern Natural Gas Co., and **R. P. Drybread** has been named reserves engineer there. Both appointments are in the gas reserves and availability section. Penn was formerly with Gulf Oil Corp.; Drybread, with Frankfort Oil Co. and Phillips Petroleum Co.

Clarence Eugene Whipp, Jr., formerly with Highland Oil Co., has joined Trunkline Gas Co. of Houston as district geologist in the southern Louisiana district, Lafayette, La. Whipp was with Sohio Petroleum Co. and Louisiana Geological Survey before joining Highland.

Hal D. Fox, Oklahoma district geologist for Sohio Petroleum Co., has been promoted to district exploration manager. **G. W. Velotta,** senior geologist, replaces Fox as district geologist. **Neal Clayton,** staff geophysicist at Oklahoma City, has been transferred to Lafayette, La., as Louisiana district geophysicist. In other appointments, **Bernard A. Taylor,** district geologist at Casper, Wyo., has been named district exploration superintendent there, and **C. F. Moore, Jr.,** district geophysicist at Billings, Mont., has been named district exploration superintendent.

C. L. (Dutch) Shultz and Frank Sparks have formed C. L. Shultz & Associates in Houston as consulting

C. L. SHULTZ

FRANK SPARKS

firm for process companies, industrial contractors, and engineering firms. Shultz was instrument engineer with Shell Oil Co. before his retirement. Sparks was also process engineer for Shell at one time.

J. D. Hicks, superintendent of production for Tennessee Gas Transmission Co., has been transferred to Monahans, Tex., from Oklahoma City.

George W. Holbrook, Jr., production engineer with Bradley Producing Corp., has been transferred to Tulsa from Wellsville, N. Y.

Leo J. Gude, formerly consultant and producer in Odessa, Tex., and Hobbs, N. M., has joined Paul C. Teas in Dallas as chief geologist and engineer.

R. L. Elkins, mechanical engineer for Shell Oil Co. in Odessa, Tex., has been promoted to division mechanical engineer and transferred to Hobbs, N. M.

Dr. F. E. James has been promoted by American Oil Co. to group leader in the economics section, research and development department. James has been with Amoco since 1953.

D. J. Kull, formerly on 2-year assignment at Shell Oil Co.'s New York and Wichita offices, has been named area geologist for the company in Denver. He succeeds **J. W. McDonald,** who has been transferred to New York on special assignment.

Dr. A. D. Cumming, principal geologist in the geology division of the Saskatchewan Department of Mineral Resources, has been promoted to chief geologist, geology division, petroleum and natural-gas branch. **A. J. Williams,** principal engineer in the reservoir division, has been promoted to chief engineer and will head the division. **A. B. Gibson,** senior reservoir engineer in the department's crown reserve division, has been appointed administrator of this division.

West Central Texas A.I.M.E. Officers Named

These men will head the West Central Texas section of American Institute of Mining, Metallurgical, and Petroleum Engineers during 1957. Front row, left to right, are L. G. Neely, chairman, Neely & Neely; and Phil M. Bridges, secretary-treasurer, Russell Engineering Co. Standing are, left to right, E. L. Anders, second vice chairman, LeClair Operating Co., Inc.; W. H. Hucklebridge, director, Harbison-Fischer; and A. J. Evans, first vice chairman, Warren Petroleum Corp.

Fred A. Hildenbrand, geologist with Atlantic Refining Co. in Billings, Mont., has been promoted to senior geologist and transferred to Tulsa.

Elvin A. Henke, senior engineer at Shell Oil Co.'s Wilmington, Calif., refinery engineering office, has been transferred to the company's head office in New York.

Allen L. Smith, petroleum engineer with Gulf Oil Corp. at Ardmore, Okla., has joined Cooperative Refinery Association as petroleum engineer in Kansas City.

Jesse W. Wright, senior geologist at Stanolind Oil & Gas Co.'s Midland, Tex., district office, has resigned to open offices in Midland as a geological and geophysical consultant.

T. J. Oleszko has been appointed manager of Aurora Gasoline Co.'s new technical service department. **R. W. Sheets** has been named manager of the economics and yield department, with **L. Milhaly** as special engineering assistant in this department. **R. Hendry** will be head of the department's yield section.

Alexander Erickson has been appointed production engineer with Cities Service Oil Co. in Great Bend, Kans.

Jodie R. Lander has been appointed senior chemical engineer at the Baytown, Tex., refinery of Humble Oil & Refining Co.

Harry H. Sisson has been named chief geophysicist for Monterey Oil Co., Houston. Sisson was chief seismologist for Robert H. Ray Co. of Houston before joining Monterey.

C. E. Evans, general manager of the Grangemouth, Scotland, plant of British Hydrocarbon Chemicals, Ltd., has been named general manager of the company and moved to the Devonshire House headquarters of the firm in London. Evans joined British Petroleum Co. in 1939 in Iran and was works manager of the Abadan refinery when the industry was nationalized in 1951. Among the last to leave the country, he received the Order of the British Empire for his services. He will be replaced at Grangemouth by **D. Blair Watt,** a veteran of 19 years with B.P. British Hydrocarbon Chemicals is owned jointly by B.P. and Distillers Co., Ltd.

Personals

Donald L. Bieber, formerly geologist with Skelly Oil Co., has joined Anderson-Prichard Oil Corp. in Wichita.

D. D. Bovaird, president of Bovaird Supply Co., Tulsa, has been elected a director of Zapata Petroleum Corp.

Dan J. Kemeny, geophysicist for Sohio Petroleum Co., has been transferred to Oklahoma City from Houston.

Rudy B. Callihan, engineer with Stanolind Oil & Gas Co. in Beaumont, Tex., has been named production engineer and tranferred to Angleton, Tex.

William P. Siard, district geologist at Midland, Tex., for Ashland Oil & Refining Co., has resigned to open an office in Midland as a consulting geologist.

William W. Wingate, regional additives manager for the DuPont Co. in Tulsa, has been appointed assistant manager of the Mid-Continent region petroleum chemical division. He succeeds **Barrett B. Russell,** who has been named assistant manager of the Gulf Coast area.

Tidewater Oil Co. has announced nine appointments at its new Delaware Flying A Refinery, Delaware City, Del. **Raymond K. Arzinger,** formerly assistant engineer at the company's Bayonne, N. J., refinery, has been named technical foreman of the utilities and sulfur-recovery area. **Charles H. Bennett,** formerly assistant process engineer at Bayonne, will be unit technical foreman of the cracking area. **William W. Burleigh** has been named technical foreman of the desulfurizing and hydrogen area. **William J. Doyle, Jr.,** formerly chemical engineer at Bayonne, will be unit technical foreman of the crude area at the new refinery. **Laurance A. Gleason,** coordinator with Tidewater's eastern division lubricants supply department, has been named unit technical foreman of the alkylation polymerization area at Delaware City. **Edwin J. Hoffman,** group leader at Bayonne, will be unit technical foreman of the coking area. **Glenn W. Wimberly,** combustion engineer at Bayonne, will be unit technical foreman of the reforming and extraction area, and **R. E. Lumpkin,** formerly engineer with The Texas Co., has joined the company as a general coordinator. **Leroy V. Scott** has been named supervisor of employe relations at Delaware City.

Personals

Allen R. Heidebrecht, chief engineer with Platte Pipe Line Co., Kansas City, has been promoted to manager of operations and engineering. Heidebrecht was with Kansas Gas & Electric Co. before joining Platte in 1950. He had been chief engineer since 1953.

G. A. Naert, petroleum engineer for Ohio Oil Co., has been transferred to Houston from Bridgeport, Ill.

William B. Dansfield, division geologist for Bankline Oil Co. at Midland for 3 years, has resigned to become an independent oil operator there.

Emil D. Williams, production superintendent with Harrington, Marsh & Wagner, has been transferred to Lamar, Colo., from Pampa, Tex.

A. W. Goodson, production foreman for Southern Production Co., Inc., in Midland, Tex., has been transferred by Sinclair Oil & Gas Co. to Houma, La., in the same capacity.

O. B. Coleman has been named drilling foreman, senior grade, in the Taft, Calif., production department of General Petroleum Corp. **T. J. Abshier** has been appointed production engineer at Taft.

Joe E. Guyer and **Harry Dernick** have formed Dernick-Guyer, Inc., with headquarters in Denver. The company will operate in the Rocky Mountain and Canadian areas as drilling contractors, operators, and consultants. Guyer is president of the new company, and Dernick is vice president and secretary-treasurer.

Earl J. Whitaker has been elected chairman of the Billings, Mont., petroleum section of American Institute of Mining, Metallurgical, and Petroleum Engineers. Whitaker is with Northern Pacific Railway's oil development department. Other officers are **Maury Anderson,** first vice chairman, Northern Pacific; **Joe McClure,** second vice chairman, Dowell, Inc.; **Gary Brown,** secretary-treasurer, Mobil Producing Co. Elected directors were **Don Bishop,** Lane Wells, Inc.; **M. E. Welbourn,** Shell Oil Co.; and **W. A. Scott,** Shell Oil Co., past chairman of the group.

Charles A. Shaid, production foreman with Sinclair Oil & Gas Co., has been transferred to Monahans, Tex., from Artesia, N. M.

Don R. Teis, formerly with Lawton Oil Corp., Magnolia, Ark., has joined Foree Drilling Co. in Dallas.

Walter H. Johnson has joined Liquefied Petroleum Gas Association as staff engineer. Johnson was formerly with Socony Mobil Oil Co. in East Chicago, Ind.

E. Wayne Corrin, president of Hope Natural Gas Co., has been elected a director of the parent company, Consolidated Natural Gas Co.

Dan E. Furse, production foreman with Amerada Petroleum Corp., has been transferred to Farmington, N. M., from Lovington, N. M.

Henry C. Oliver has been appointed group leader in the Standard Oil Co. (Ind.) technical service department at Whiting, Ind.

H. A. Koch, Jr., Atlantic Refining Co., has been elected 1957 chairman of the Dallas section of American Institute of Chemical Engineers. Other officers are **Morris Bock,** vice chairman, Sun Oil Co.; **R. E. Styring, Jr.,** corresponding secretary, Atlantic Refining Co.; **John Crow,** recording secretary, Graff Engineering Co.; and **George Leachman,** treasurer, Seaboard Oil Co.

Larry Brundall, Geophoto, Inc., has been named president of Rocky Mountain Association of Petroleum Geologists. Other officers are **Bill Mallory,** first vice president, Phillips Petroleum Co.; **Charles MacGinnis,** second vice president, The California Co.; **Robert Pott,** secretary-treasurer, Forest Oil Co. **Thad Carpen,** Continental Oil Co., and **Roland Hodden,** Stanolind Oil & Gas Co., are newly elected councilors.

Charles Eger, geologist with Gulf Oil Corp., has been transferred to Midland, Tex., from Bismarck, N. D.

Orbie N. Lambright, seismic party manager with Cities Service Oil Co., has been transferred to Seminole, Tex., from Lovington, N. M.

C. L. BLACKSHER

Claud L. Blacksher, southern area production superintendent for Skelly Oil Co., has been appointed manager of production. Blacksher succeeds **J. S. Freeman,** who was recently elected president of the company. Blacksher joined Skelly in 1931. He was district superintendent at Pampa, Tex., before becoming southern area production superintendent in Tulsa in 1954.

William W. Clark, division geophysicist with Carter Oil Co., has been transferred to Denver from Shreveport, La.

George Jarvis, director of the Wyoming Oil and Gas Conservation Commission and state mineral supervisor, has resigned to become an independent oil operator.

William A. Hoff, operations engineer with Sharples Chemicals Co. in Wyandotte, Mich., has joined Standard Oil Co. (Ohio) as senior process engineer in Toledo.

Edward P. Edmiston is president of a new firm, Edmiston Brothers Drilling Co., Inc., Tulsa. **Dave L. Edmiston, Jr.,** is vice president and **D. J. Edmiston,** secretary-treasurer. The company's main offices are in Tulsa with an operating office in Cushing, Okla. Edward P. and Dave Edmiston are sons of **D. L. Edmiston, Sr.,** president of Arrow Drilling Co.

DEATHS

Raymond C. Roberts, 37, president of Roberts Oil Co., Costa Mesa, Calif., and his wife, **Leona M. Roberts,** 37, were killed January 3 in an airplane crash while en route to Phoenix, Ariz.

Maurice A. Brewster, 73, Oil City, Pa., retired director, vice president, and treasurer of Pennzoil Co., died January 8 in Oil City.

Wendell G. Thayer, former executive of Union Oil Co. of California, died in Orange, Calif., January 5. At the time of his death Thayer was executive director of the Feather River Project Association.

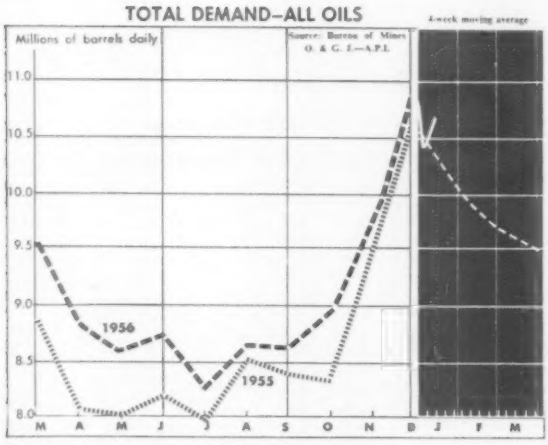
George L. LeBus, Sr., 80, founder of LeBus Rotary Tool Works and an oil producer and driller in the North Texas area, died recently in Wichita Falls. LeBus was a pioneer in the manufacture of drilling tools.

Walton G. Christian, 76, retired drilling contractor and independent producer, died January 6 in Houston.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,384,675	DOWN	10,865	UP	211,638
Crude stocks	259,983,000	DOWN	4,258,000	DOWN	115,000
Completions	983	DOWN	64	DOWN	56
Refinery runs	8,272,000	DOWN	18,000	UP	323,000
Gasoline stocks	189,243,000	UP	2,076,000	UP	17,337,000
Kerosine stocks	29,795,000	DOWN	1,399,000	UP	5,361,000
Distillate stocks	122,983,000	DOWN	9,959,000	UP	21,909,000
Residual stocks	42,727,000	DOWN	4,000	UP	3,402,000
Four-product stocks	384,748,000	DOWN	9,286,000	UP	48,009,000
Total imports	1,682,900	UP	167,800	UP	492,900



Expected Price Increase Caused Record Drop in Distillate Stocks

MOST product markets are reflecting the crude-price increase that came just after the start of the year.

The combination of adjustments for higher crude and corrections for subnormal gasoline markets in the Group 3 area has given spot gasoline a boost that may not hold. Before the crude advance, regular gasoline from the Mid-Continent was selling to unbranded jobbers along the Great Lakes Pipe Line for 10.75 cents a gallon plus transportation charges. This price was 0.75 a gallon below normal the refinery price, based on tank-wagon postings.

Following the crude-price increase, tank-wagon prices for gasoline increased a cent a gallon in most areas. Group 3 spot market quotations moved up 1.25 cents to 12.00 cents a gallon. General reports from refineries indicate that there has been no big improvement in the gasoline-stock picture. Unless the rate of increase in gasoline inventories slows down over the next few weeks, some refiner will find that he needs to sell some gasoline in a hurry. If he follows the pattern that was general in 1956, he will cut his price. Since other spot sellers will meet his lower price, the Group 3 gasoline spot market will be back to the same 0.75 cent below normal.

Some Mid-Continent refiners are quoting 9.75 cents a gallon for No. 2 fuel, but current reports indicate that most spot material is going to jobbers at 9.50 cents. Cold weather in the North Central states is cutting down distillate inventories but stocks still are well above last year. Total distillate stocks for Mid-Continent and North Central districts on January 11 amounted to 37,959,000 bbl. This represented a reduction of 2,731,000 bbl. from the previous week but was 9,687,000 bbl. more than for the corresponding date in 1956.

Total distillate stocks for the country as a whole dropped almost 10,000,000 bbl. for the week ended January 11, but the surplus over last year was 21,908,000 bbl. This unusual weekly decrease in distillate stocks resulted in an abnormal gain in calculated demand for distillate for the week. A comparison of withdrawals from stocks with refinery production of distillate during the week gives a picture of the movement to consumers.

Total distillate production for the 7-day period was 14,393,000 bbl. All of that volume was sold plus almost 10,000,000 bbl. from storage.

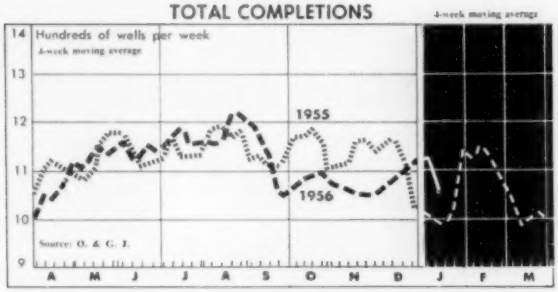
Customers expected a change in distillate prices following the higher postings for crude. The first crude-price increase was announced on January 3. Other companies were meeting the new quotations by the week end. The amount of the increase for crude indicated a boost of about 1.0 cent a gallon for distillate. Many customers filled their tanks before the increase.

With normal weather, the decrease in distillate stocks for the week ended January 18 would be small, following the big drop the week before. However, the very cold weather in the high-demand areas may produce a near-normal reduction for the week.

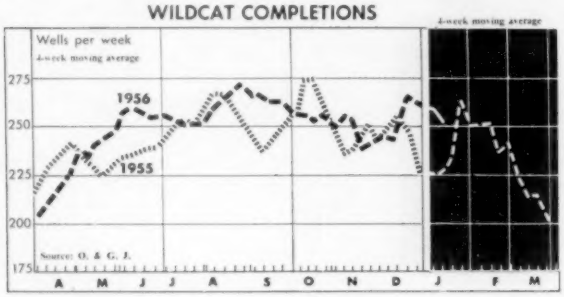
Light-fuel prices moved up again on the Gulf Coast, bringing No. 2 distillate to 10.00 cents a gallon on the low. Lowest quotations for residual on the Gulf Coast is $2.75 a barrel with supplies very tight.

Both light and heavy fuels moved up on the East Coast.

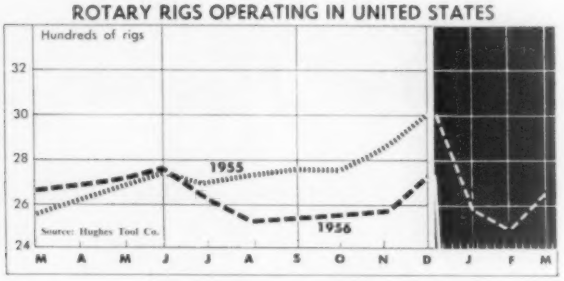
TOTAL COMPLETIONS



WILDCAT COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



ACTIVE ROTARY RIGS*

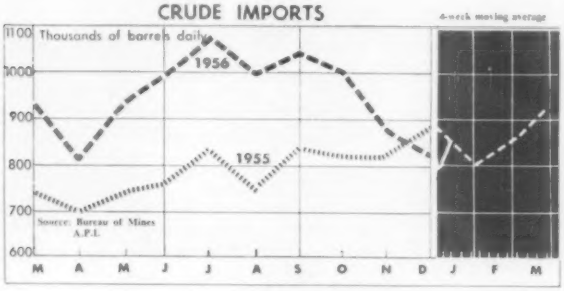
Area—	1-14-57	1-7-57	1-16-56
North Central and East	80	88	107
Southeast	32	34	35
Okla., Kans., Ark., Mo.	418	431	488
Louisiana	431	438	429
North and East Texas-Panhandle	370	379	449
Gulf and South Texas	239	243	275
West Texas-New Mexico	462	471	489
Rocky Mountain	193	201	238
Pacific Coast	105	110	131
Total United States	2,330	2,395	2,641
Western Canada	226	222	213

*Hughes Tool Co.

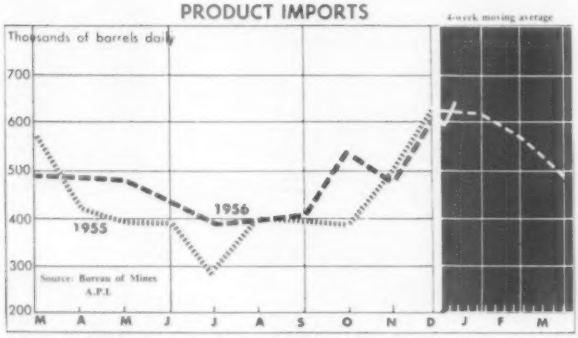
WEEKLY WELL COMPLETIONS . . . WEEK ENDED JANUARY 12, 1957

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1956				
	Comp.	Oil	Gas	Dry	Footage	1957	1956	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
Arkansas	21	9	0	12	62,410	34	30	0	0	0	5	5	0	0	0	6	6
California	40	21	0	19	229,082	87	78	1	0	0	16	17	1	0	0	26	27
Colorado	14	2	0	12	68,645	65	49	1	0	0	11	12	1	0	1	41	43
Illinois	61	21	0	40	140,156	61	187	0	0	0	17	17	0	0	0	17	17
Indiana	0	0	0	0	0	22	21	0	0	0	0	0	3	0	0	4	7
Kansas	80	38	6	36	295,762	166	150	3	0	0	12	15	7	0	0	26	33
Kentucky	2	0	2	0	5,755	37	53	0	0	0	0	0	3	0	0	4	7
Louisiana	45	29	2	14	309,449	118	181	1	0	1	3	5	2	0	2	11	15
North	20	11	1	8	71,894	71	71	0	0	0	2	2	0	0	1	7	8
South	20	13	1	6	191,639	38	110	1	0	1	1	3	2	0	1	4	7
Offshore	5	5	0	0	45,916	9	....	0	0	0	0	0	0	0	0	0	0
Michigan	3	2	0	1	10,865	13	30	1	0	0	0	1	1	0	0	3	4
Mississippi	0	0	0	0	0	6	32	0	0	0	0	0	0	0	0	1	1
Montana	4	2	1	1	24,602	11	23	0	0	0	1	1	0	0	0	2	2
Nebraska	13	2	0	11	70,426	31	39	1	0	0	6	7	1	0	0	21	22
New Mexico	27	22	1	4	114,117	48	47	2	0	0	3	5	3	0	0	4	7
Northwest	6	4	1	1	28,494	27	14	1	0	0	1	2	2	0	0	2	4
Southeast	21	18	0	3	85,623	21	33	1	0	0	2	3	1	0	0	2	3
North Dakota	8	5	0	3	63,505	14	11	0	0	0	3	3	1	0	0	5	6
Ohio	13	8	2	3	35,043	37	49	0	0	0	0	0	0	0	0	0	0
Oklahoma	92	56	2	34	309,918	237	328	2	1	0	11	14	3	2	0	30	35
Pennsylvania-New York	3	0	3	0	9,357	13	9	0	0	0	0	0	0	0	0	2	2
Texas	425	247	23	155	1,819,106	848	811	15	0	3	97	115	31	1	7	197	235
Southwest (1 & 4)	35	12	4	19	157,378	79	148	1	0	1	8	10	5	1	1	26	33
Gulf Coast (2 & 3)	58	25	11	22	420,376	95	142	0	0	2	17	19	1	0	4	23	28
East (5 & 6)	19	8	1	10	100,773	41	54	0	0	0	7	7	0	0	0	12	12
N. Central (7-B & 9)	167	86	1	80	432,097	312	259	9	0	0	50	59	18	0	2	99	119
West (7-C & 8)	114	97	0	17	562,736	253	184	4	0	0	10	14	6	0	0	24	30
Panhandle (10)	32	19	6	7	145,746	68	24	1	0	0	5	6	1	0	0	12	13
Utah	0	0	0	0	0	7	2	0	0	0	0	0	1	0	0	5	6
West Virginia	17	1	12	4	52,779	34	32	0	0	1	0	1	0	0	3	0	3
Wyoming	19	10	0	9	64,071	44	26	2	0	0	5	7	3	0	0	13	16
Miscellaneous (Mo.)	6	0	3	3	7,843	7	1	0	0	0	0	0	0	0	0	1	1
Total U. S.	893	475	57	361	3,692,891	1,940	2,193	29	1	5	190	225	61	3	13	418	495
Total previous week	1,047	528	83	436	4,205,088	....	....	32	2	8	228	270	32	2	8	228	270
Total Jan. 14, 1956	1,039	514	76	449	4,314,752	....	....	23	5	6	239	273	63	15	14	466	558
Cumulative 1957	1,940	1,003	140	797	7,897,979	....	....	....	....	....	....	....	....	....	....	....	....

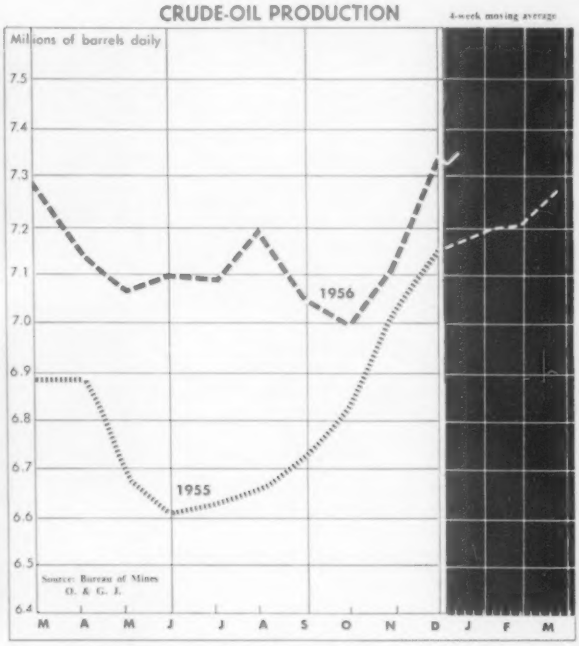
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

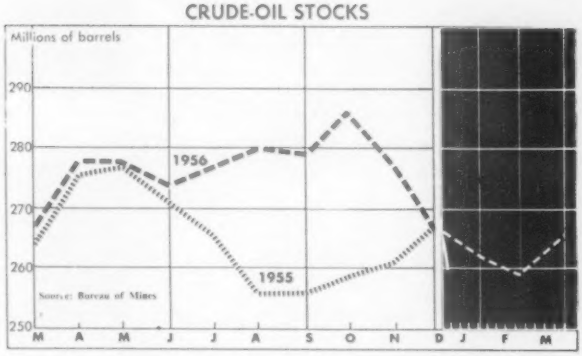


DAILY AVERAGE PRODUCTION FOR WEEK

	January 12, 1957			Jan. 5
	Crude oil	Lease condensate	Total	total
Alabama	11,500		11,500	11,440
Arkansas	80,000	350	80,350	77,650
California	945,800		945,800	949,100
Colorado	157,200		157,200	161,500
Eastern	50,000		50,000	56,000
Florida	1,300		1,300	1,250
Illinois	237,700		237,700	237,200
Indiana	33,600		33,600	33,100
Kansas	†324,000		†324,000	†339,100
Kentucky	48,500		48,500	48,300
Louisiana	898,200	81,000	979,200	945,250
North	128,200	3,000	131,200	131,100
South	770,000	78,000	848,000	814,150
Michigan	27,900		27,900	27,100
Mississippi	108,725	5,100	113,825	113,800
Montana	67,150		67,150	67,250
Nebraska	38,650		38,650	37,850
Nevada	100		100	100
New Mexico	245,500	4,850	250,350	248,850
North Dakota	39,100		39,100	38,950
Oklahoma	†597,200		†597,200	†631,600
Texas	3,023,000	56,150	3,079,150	3,070,150
Dist. 1	55,500	575	56,075	56,075
Dist. 2	145,500	8,750	154,250	153,850
Dist. 3	432,500	26,000	458,500	457,650
Dist. 4	230,000	6,700	236,700	236,700
Dist. 5	39,500	550	40,050	40,050
Dist. 6	130,000	6,300	136,300	135,025
East Texas Field	207,000		207,000	207,375
Dist. 7-B	162,000	75	162,075	160,775
Dist. 7C	168,000	4,600	172,600	171,750
Dist. 8	1,143,000	1,450	1,144,450	1,138,025
Dist. 9	209,000	850	209,850	209,425
Dist. 10	101,000	300	101,300	103,450
Utah	9,000		9,000	9,000
Wyoming	293,000		293,000	290,800
Others	‡100		‡100	‡100
Total U. S.	7,237,225	147,450	**7,384,675**	7,395,540
Change from prev. week, down			**10,865**	
Canada	†484,400		†484,400	†518,000
Total U. S. production-Jan. 1-Jan. 12				88,670,425 bbl.
Same period last year (crude plus cond.)				*86,244,794 bbl.

*Includes 1,488,200 bbl. condensate. †Week ended previous Monday. ‡S. Dakota.

CRUDE-OIL STOCKS

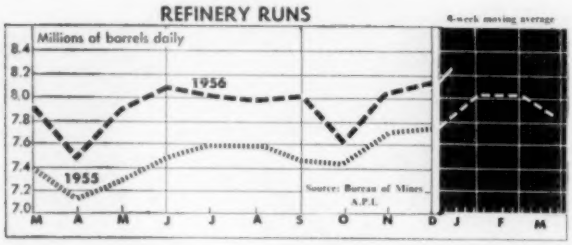


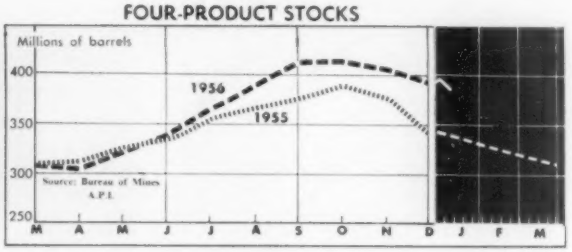
CRUDE-OIL STOCKS BY STATES OR ORIGIN*

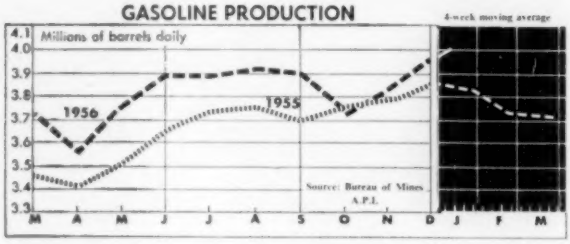
(Thousands of barrels)

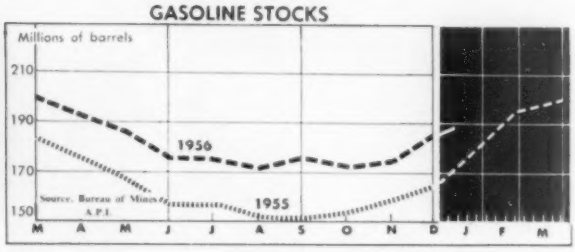
	1-5-57	12-29-56	1-7-56
Pennsylvania Grade	2,372	2,397	2,867
Other Appalachian	2,328	12,239	2,131
Illinois, Indiana, Michigan	10,837	10,833	9,213
Nebraska, North Dakota	2,220	2,095	2,011
Kansas	9,923	10,047	7,684
Oklahoma	22,825	23,433	21,403
Arkansas	2,864	2,880	2,174
Louisiana	18,635	19,001	15,798
North	3,083	4,402	2,699
South	15,552	14,599	13,099
Mississippi	2,761	2,620	2,945
New Mexico	7,827	7,901	7,883
Texas	114,969	117,425	124,466
East Texas proper	9,097	9,057	9,433
West Texas	53,340	43,224	57,848
Texas Gulf	21,998	22,576	24,542
Other Texas	30,534	31,568	32,643
Wyoming	16,028	16,637	15,259
Other Rocky Mountain	6,786	6,395	6,237
California	27,987	28,170	27,894
Foreign	†11,621	12,168	12,133
Total	259,983	264,241	260,098

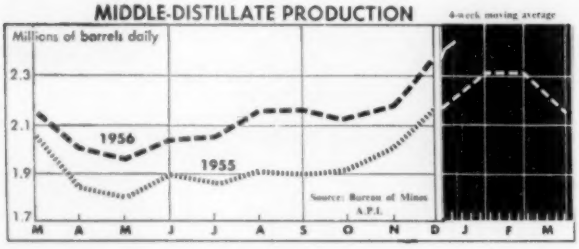
*Bureau of Mines. †Includes 2,754,000 bbl. in California.

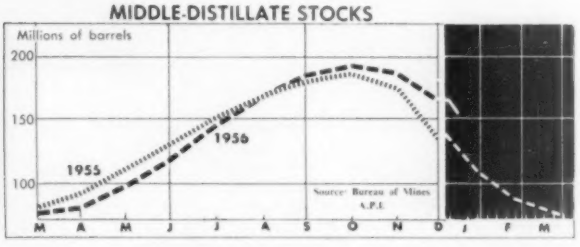


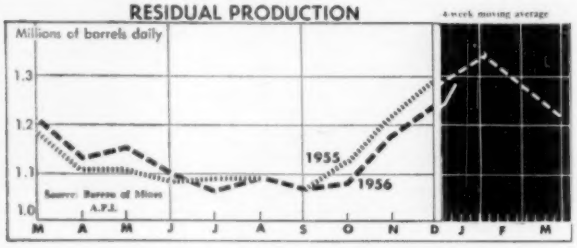


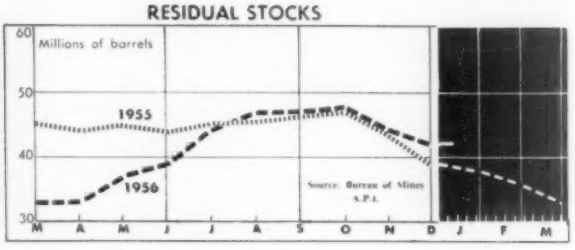












A.P.I. REFINERY REPORT, JANUARY 11, 1957

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, January 1956—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,257	510.6	36.7	360.6	258.1	40,300	12,153	46,324	11,034	1,132	483.0	41.6	300.7	259.6
Appalachian:														
District 1	97	41.7	5.5	23.9	8.3	5,075	561	2,940	471	105	44.7	5.6	27.1	11.5
District 2	111	61.1	7.6	21.3	12.9	3,096	588	1,001	260	104	52.3	7.9	18.4	17.3
Ind., Ill., Ky.	1,476	773.7	81.3	325.4	219.6	33,601	6,527	19,078	5,416	1,492	761.7	75.9	336.3	222.9
Minn., Wis., Dak.	95	45.6	4.4	24.1	8.3	7,181	1,352	7,089	223	87	41.4	9.9	18.5	10.6
Okla., Kans., Mo.	728	409.6	14.3	201.6	45.0	17,924	1,396	11,792	1,517	708	407.1	17.1	190.1	43.7
Inland Texas	282	206.1	7.6	54.4	23.4	7,728	601	1,862	1,897	278	192.5	8.3	53.5	26.8
Texas Gulf Coast	1,997	920.0	145.0	550.7	253.3	26,066	3,037	10,028	5,901	1,908	895.3	138.3	527.5	251.2
La. Gulf Coast	663	339.6	54.0	227.8	59.1	12,666	2,109	5,294	1,870	697	313.0	62.7	175.7	58.1
N. La. and Ark.	103	43.3	8.0	23.6	6.9	5,226	702	2,348	272	94	36.7	8.7	21.3	8.6
Rocky Mountain:														
New Mexico	26	13.6	0.6	4.7	3.6	524	13	107	70	22	11.5	0.7	3.3	3.2
Other Rocky Mtn.	270	135.1	4.6	64.3	36.1	6,090	429	2,638	921	269	131.2	4.9	66.6	44.0
West Coast	1,167	454.9	5.0	173.7	396.7	23,766	327	12,482	12,875	1,127	472.5	3.6	184.1	386.8
Jan. 11, 1957	8,272	3,953.9	374.6	2,056.1	1,331.3	189,243	29,795	122,983	42,727	8,023	3,842.9	385.2	1,923.1	1,344.3
Jan. 4, 1957	8,290	4,030.0	414.1	2,066.9	1,249.3§	187,167	31,194	132,942	42,731					
Jan. 13, 1956	7,949	3,835.3	349.7	1,934.4	1,311.3	171,906	24,434	101,074	39,325					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. §Revised.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
★ Regular (88 octane)	12.00-12.25
★ Premium (96 octane)	13.75-14.00
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	11.25-11.50
Regular (92 octane)	11.50-11.75
★ Premium (97 octane)	13.25-13.50
★ Premium (98 octane)	13.50-14.00
California (rack):	
Regular (84 octane)	12.6-13.1
Premium (93 octane)	13.6-14.1
Premium (96 octane)	14.6-15.1
Caribbean area (cargoes):	
★ Regular (87 octane)	10.125
★ Premium (93 octane)	11.625

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	5.0
Breckenridge:	
Grade 26-70	4.5

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
★ Kerosine 42-44	10.50-10.75
★ Diesel oil (58 d.i. and above)	10.125-10.375
★ Distillate No. 1	10.125-10.375
★ Distillate No. 2	9.50-9.75
Gulf Coast (cargoes):	
★ Kerosine 41-43	10.50-10.75
★ Distillate No. 2	10.00-10.25
New York Harbor (barges):	
★ Kerosine 41-43	12.25
★ Distillate No. 2	11.65
★ Diesel fuel, 48-52 d.i.	11.95
Caribbean area (cargoes):	
★ Distillate No. 2	10.0

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
★ Residual fuel (max. 1% S)	$2.45-2.70
Gulf Coast (cargoes):	
★ Bunker C fuel	$2.75-2.90
New York Harbor (barges):	
★ Bunker C fuel	$3.30
Caribbean (cargoes):	
★ Bunker C	$2.55
California (rack):	
★ Bunker C fuel, Los Angeles	$2.60-2.75

LUBRICATING OILS

Mid-Continent (Group 3):	
★ 150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	25.5
★ 200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	27
200 vis. neutral (180 at 100°), 25 p.t.	25

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.42				
15-15.9	2.46				$1.89
16-16.9	2.49				1.94
17-17.9	2.53				1.99
18-18.9	2.57				2.04
19-19.9	2.60				2.09
20-20.9	2.64	$2.75		$2.62	2.14
21-21.9	2.68	2.77		2.64	2.19
22-22.9	2.72	2.79		2.66	2.24
23-23.9	2.76	2.81	$3.44	2.68	2.29
24-24.9	2.80	2.83	3.46	2.70	2.34
25-25.9	2.84	2.85	3.48	2.72	2.39
26-26.9	2.88	2.87	3.50	2.74	2.44
27-27.9	2.92	2.89	3.52	2.76	2.49
28-28.9	2.97	2.91	3.54	2.78	2.59
29-29.9	3.02	2.93	3.46	2.80	2.59
30-30.9	3.07	2.95		2.82	2.63
31-31.9	3.13	2.97		2.84	2.67
32-32.9	3.19	2.99		2.86	2.71
33-33.9	3.25	3.01		2.88	2.75
34-34.9	3.31	3.03		2.90	2.79
35-35.9	3.36	3.05		2.92	2.83
36-36.9	3.40	3.07		2.94	2.87
37-37.9	3.43	3.09		2.96	2.89
38-38.9		3.11		2.98	2.91
39-39.9		3.13		3.00	2.93
40 and up		3.15		3.02	2.95

*Includes Oklahoma, most of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low cold test Gulf Coast. ‡Sour.

Effective dates: California, November 19, 1956; east of California, January 3-Janaury 10, 1957; Pennsylvania Grade, August 16, 1956.

Some crudes in North Central Texas and West Central Texas, are on the intermediate schedules.

FLAT PRICES

Louisiana:	
★ Bienville (distillate)	$3.05
★ Ville Platte	3.45
Texas:	
★ East Texas	3.25
★ Conroe	3.53
★ Van	3.13
Pennsylvania Grade:	
★ Bradford	4.88
★ Middle District	4.70
★ Southwest Pennsylvania	4.41
★ West Virginia	4.23
★ Buckeye Grade	4.23
★ Zanesville Grade	3.27
★ **Illinois Basin**	**3.15**
Canada:	
★ Leduc-Woodbend (flat prices D-2), D-3)	2.78
★ Redwater (Alta.) D-3	2.67
★ Smiley-Viking (Sask.)	2.44
★ Pembina	2.65

FOREIGN

Venezuela:	
★ Cumarebo, 48°-49.9°, Tucupido	3.75
★ San Joaquin, 40°-40.9°, Puerto La Cruz	3.37
★ Oficina, 35°-35.9°, Puerto La Cruz	3.05
★ Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
★ Quiriquire, 16.5°-16.9°, Caripito	2.45
★ Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
★ Bachaquero, 16.5°-16.9°, Las Piedras*	2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.69
Iraq, 36.0°-36.9°, Tripoli, Banias	2.69
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

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★ Gulf-U.S.N.H., dirty (USMC +152.5%)	$7.20
★ N.W.I.-U.S.N.H., dirty (Scale+230%) (55s. 10d.)	7.81
★ N.W.I.-U.K., clean (Scale+275%) (121s. 11d.)	17.06
★ N.W.I.-U.K., dirty (Scale+270%) (120s. 3d.)	16.83
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6—Brown fintube exchangers, 300# 140 sq. ft. 4-6 chrome.
1—5' x 96' tower, 40 tray, 135# WP.
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Large Selection of Series 15, 30 Steel Valves, 1" to 8"

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3 Pacific ITB, 400 gpm—2,000' hd, 735 gpm—3,100' hd.
5 Pacific SVTB, 612 gpm—600' hd, 324 gpm—480' hd, 308 gpm—516' hd, 193 gpm—389' hd.
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1 Worth LTC-6 800 hp.
2 Clark RA-5 500 hp.
3 Penn Comps 100 CFM 500 lbs. 385 CFM 160 lbs.

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5—Sweetland Filters No. 12, No. 10, No. 7, No. 5.
4—Rotary Vac. Filters, 10 x 12, 8 x 10, 5 x 8.
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30—304 SS shell & tube condensers 100-1000 sq. ft.
Lab Petro-Chem furnace 50,000 BTU/hr.
9—3' x 10' 410 SS Sheets.
Tremendous selection stainless steel and steel valves 1½"-6".
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BUBBLE TOWER ABSORBER—36" Dia. x 59'4" tangent to tangent welded, 30 tray Bubble Tower with 4'10" skirt, orig. designed max. W.P. 350# at 400 degree F., orig. max. test pressure 780 P.S.I. Shell thickness ¾", Bottom head ⅞". Top head ⅝", Manufactured Dec. 1933 by A. O. Smith Corp. Already layed down. Sell cheap or trade for Casing. Comanche Gasoline Plant, Comanche, Oklahoma. Phone 396.

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Capacity from 3" to 8⅝" O.D.
Cutting speed from 60 to 240 feet per minute
Two machines—one left hand, one right hand.
With collets in ¼" multiples from 3" to 7¾" for each machine.
New—1944—excellent machines.
To rework used casing and line pipe.

Motors:

Main drives—4 Reliance Motors 25 hp. 230 volts DC. 850 to 1700 RPM. Frame 131
Coolant pumps motors 4—900 RPM, ¼ HP, 3/60/440.
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7" O.D. 9187' 23# 8 Rd Thrd N-80
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8000' 4½" LAP WELD line pipe, weight 10.70 lbs., 40' random lengths, clean inside and out, straight, beveled, ready to lay. 75c. M. J. Regan Pipe Co., Coffeyville, Kans.

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New Surplus Material
6", 8", 12", 14", 16"

575—6" Std. stock, 90° pipe bends, gal. thread., radius 25½".

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1— 210 bbl. welded
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2—5000 bbl. bolted—2 ring
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4—55,000 barrel closed riveted steel tanks.
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18—4" 3000-lb. Wog, Face to Face 20"
900-lb. Flanges, can be furnished in ¼" RF or RTJ.
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All information confidential.

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EXPERIENCED oil field supply credit man to headquarter in Tulsa. Must have had credit department experience with an oil field supply company in Oklahoma. Write in detail experience, qualifications, and salary requirements. Reply Box J-894, The Oil and Gas Journal, Tulsa, Oklahoma. Our employees know of this advertisement and all replies will be kept confidential.

DIVISION OF PRODUCTION, American Petroleum Institute, is seeking staff engineer for permanent position. Optimum background would be mechanical engineering education, plus 5 to 10 years experience in drilling and production or oilfield equipment design or manufacture. Specialized knowledge of tubular goods or tank construction would be advantageous. Facility in written and verbal technical expression a necessity. Duties require service to and coordination of committee work on development of standards on drilling and production equipment, involving frequent contact with top technical men representing oil companies and equipment manufacturers. Travel moderate, working conditions pleasant, salary open. Location, Dallas. Replies will be held confidential and should be addressed to 300 Corrigan Tower Bldg., Dallas, Texas.

HELP WANTED

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ANDERSON-PRICHARD Oil Corporation has an opening in its Reservoir Engineering Section for a Junior Petroleum Engineer. Initial work location will be Oklahoma City. Applicants must have engineering degree; some field experience would be desirable. Please furnish a brief personal history including education and professional experience. All replies confidential. Address: Industrial Relations Department, Anderson-Prichard Oil Corporation, Liberty Bank Building, Oklahoma City, Oklahoma, Attention: Mr. D. F. Tver.

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For Core Analysis Laboratory
Rocky Mountain Area

Requires knowledge of basic core analysis and interpretation of data. Background of administrative supervision desirable. Salary open.

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Reply outlining personal history, work experience, and photo. All replies held strictly confidential.

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The successful applicant will take complete charge of a job as Project Engineer supervising the layout and design and selecting of plant equipment.

Please furnish to our Personnel Manager a complete resumé of your experience, education, references and salary requirements. Also enclose a snapshot if available. One of our many benefits is a Profit Sharing and Retirement Plan.

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A-21
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HELP WANTED

MECHANICAL ENGINEER

Progressive firm of consulting engineers serving refinery industry requires graduate mechanical engineer with 3 - 8 years experience. Interesting, varied assignments with moderate travel. Unusual opportunity for individual initiative in complete charge of projects. Pleasant eastern location. Send resume to

Box J-876, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY TECHNOLOGIST

If you are a Chemical Engineer with 3 to 5 years experience in refinery process engineering or operation and economic analysis and have an interest in consulting and technical service type work, you should investigate this unique opportunity to capitalize on your background and to participate in the growth of an expanding technical activity of a well known company allied to the refining industry. This position offers a wide variety of assignments, industry-wide contacts with refining and process companies, for using initiative and originality to increase responsibility. A midwest suburban location offers ideal professional environment. Send resume of qualifications to

Box J-891,
The Oil and Gas Journal,
Tulsa, Oklahoma.

HELP WANTED

PETROLEUM ENGINEER — Independent oil company has opening for petroleum engineer with two to four years experience to be located in Tulsa, Oklahoma. Send resume of education and experience to Box J-884, The Oil and Gas Journal, Tulsa Oklahoma.

PRODUCTION SUPERINTENDENT—Contractor-Producer needs general superintendent production, principally gas, headquarters Guymon, Oklahoma. Engineering education preferred. Good opportunity for man with proper qualifications and not afraid of field work. Replies should include details of experience, education, and personal history, with expected salary. All replies confidential. Write Box J-893, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST — Independent producing company with expanding drilling activity in Mid-Continent area needs graduate geologist as chief of staff in non-administrative capacity. Several years major company experience desirable, prefer age 30 to 40. Splendid opportunity for man eager for a participation arrangement. Give full qualifications, experience, and photo with first letter. All replies held confidential. Box J-883, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES REPRESENTATIVE

for pipeline construction equipment for New York sales area. Salary commensurate with experience and ability. Write full details of qualifications and experience to

BOX J-866,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

MANAGER OF EXPLORATION

Independent Oil Company has opening for experienced, aggressive combination geologist and landman. Must have thorough understanding of geological and land matters in Mid-Continent area and be prepared to handle full exploration program. Age limit 40. This is salaried position with excellent pay. In replying, give past employment record and educational background. All replies confidential. Reply

Box J-873, The Oil and Gas Journal,
Tulsa, Oklahoma.

PETROLEUM ENGINEERS

(Ages 30-38)

A major integrated U. S. oil company operating in Venezuela has outstanding career opportunities for RESERVOIR and PETROLEUM PRODUCTION ENGINEERS. Graduate petroleum, mechanical or chemical engineers who have a minimum of seven years of PETROLEUM ENGINEERING experience are invited to send a resume of personal data and work experience. Naturally, all replies will be held in confidence and interviews arranged for qualified candidates. Salary, including bonus, $16,500 - $18,000, depending on qualifications and experience. Excellent employee benefits, including home vacations with travel expenses.

Box 480

Dept. Y-21

New York 19, N. Y.

HELP WANTED

EXPERIENCED Chemical, Mechanical, Petroleum, or Natural Gas Engineers needed. Experience with gasoline plant design, operation, and maintenance desirable. Dallas headquarters with limited traveling to gasoline plants. If interested, write P. O. Box 2819, Dallas, Texas.

EXPERIENCED, YOUNG, cable tool driller for large water wells. Excellent yearly income with many benefits. Also experienced tool dressers. Enclose photograph with application. Egerer-Galloway Well Corporation, 1012 North Third Street, Milwaukee, Wisconsin.

REFINERY ENGINEER — Process engineering position with large independent company operating in Mid-Continent area. One to five years experience desired. State qualifications and give salary requirements. Box J-877, The Oil and Gas Journal, Tulsa, Oklahoma.

GAS ENGINEER—Leading independent oil company has opening for graduate engineer under 32 with general knowledge of construction, operation, and maintenance of gasoline plants, gathering systems, compressor stations, gas pipe lines and related facilities. Also knowledge of process engineering. Dallas, Texas, or Shreveport, Louisiana, location. Write full particulars as to personal background, education, experience, and salary requirements to P. O. Box 3053, Dallas, Texas, and enclose small photo.

GAS ENGINEER—Graduate engineer with four years or more experience and background in gas transmission engineering and operations—design of compressor station, pipeline, and related facilities—for position of staff engineer, chief engineer's office of large natural gas transmission company. Location area—Pacific northwest states. A considerable opportunity for development exists in this position. Salary commensurate with qualifications. Replies will be held confidential. Write Box J-843, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

MACHINE SHOP SUPERINTENDENT: Twenty-four years experience with major oil companies, administrative, heavy rig repair and maintenance welding, salvage and boiler shops. Finest of references. Available immediately for foreign or domestic position. Box J-885, The Oil and Gas Journal, Tulsa, Oklahoma.

DESIRE OPPORTUNITY with independent oil or gas producing company. Married, age 34, 12 years varied experience including glycol injection dehydration production and well completion. Box J-871, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, nine years experience; production administration, reservoir engineering, valuation. Desire management position with aggressive organization analyzing exploratory and development programs, and conducting reserve estimates and appraisals. Presently employed. Consider Mid-Continent or Rocky Mountain location. Box J-870, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST: Ten years experience including seismic party chief, review, supervisory work, seeks permanent position with opportunity advancement. Good Spanish; work anywhere Western Hemisphere. Box J-879, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST: Ten years seis. experience, Texas, Oklahoma, Louisiana, desires challenging responsible situation. Excellent references. Box J-887, The Oil and Gas Journal, Tulsa, Oklahoma.

SUPERINTENDENT, Graduate Engineer, 40, married; administration, drilling, production experience all major North American oil areas; desires responsible position with Texas based independent. Capable of managing operations. Employed. Box J-888, The Oil and Gas Journal, Tulsa, Oklahoma.

WOMAN, AGE 30, single, experienced in drilling and oil accounting, secretarial, and geological work, desires position in Amarillo, Texas. 500 Brown Building, Wichita, Kansas.

GEOLOGIST: Desires responsible position with an independent or drilling Co. in Dallas. Seven years experience, sub-surface geology, drilling production, workover in N.W. and S.E. New Mexico, West and West Central Texas. Single, free to travel. Box J-882, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

PRODUCTION FOREMAN: Seventeen years oil field experience. Presently employed in management capacity. Prefer Mid-Continent but other locations considered. Joe Charles. R.E.R., Pawhuska, Okla.

DISTRICT GEOPHYSICIST with major company desires position with smaller organization to supervise geophysical activities: correlate magnetic, gravity, and seismic results, and make independent interpretations of seismic data. Box J-868, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware

FOR RENT

FOh RENT: 30—15,000 gal. oil tanks and pump. For truck or rail delivery. Heated. Can be used as an oil terminal. Located at 43rd & Western. Industrial zone. Mr. C. Siegel, LAwndale 1-8570, Chicago, Illinois.

ELECTRIC LOG CABINETS

FOR ECONOMICAL FILING of full-size electric logs, most geologists prefer Kraftbilt E-24 4-drawer cabinet. Two compartments to each drawer with separate follow blocks make this cabinet handy, economical. For filing reduced electric logs, geologists use Kraftbilt E-28 8-drawer cabinet. Send for catalog 57-B. Ross-Martin Co., P. O. Box 800-A, Tulsa, Okla.

ROYALTIES

FOR SALE all or any part 5000 acres undivided oil and gas minerals under 14,000 acres. Very active area SE Colorado. Perpetual interest. Leased to major companies. $1.00 acre rentals to 1962. Priced $12.50 acre. P. O. Box 1235, Amarillo, Texas.

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EASTERN KANSAS 700', 27 API, 160 acre stripper extension. 2 wells on pump. Box 393, Lawrence, Kansas.

480 ACRES in Coleman County, Texas, 180 acres in cultivation. Three producing oil and gas wells, 120 acres not under lease. Located in Novis field. Will sell land and mineral rights to settle estate. Contact C. B. Sprinkles, 422 W. Kennedy Ave., Coolidge, Arizona.

PROVEN OR SEMI-PROVEN Leases or farmouts with drilling obligation wanted in South Texas Districts 1, 2, or 4. Box J-862, The Oil and Gas Journal, Tulsa, Oklahoma.

160 A. OIL LEASE, eastern Utah, center of activity, near gas. R. Barnsley, 950 Lincoln Ave., Palo Alto, Calif.

UTAH OIL LEASES on U. S. owned land in all counties where drilling active. 640 acre leases. 5 years and renewable 5 more. Free information. John L. Donahue, Empire Bldg., Denver 2, Colorado.

FOR SALE . . .

OIL, GAS and MINERAL LEASES

In the fabulous Clear Creek Area, (Range 7 East, Township 13 South) Carbon County, Utah.

APPROX. 4520 ACRES
NEAR PIPELINE
WILL PARTICIPATE IN
DEVELOPMENT.

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Portland, Oregon

Phone CA 7-3405

BUSINESS OPPORTUNITIES

WILL BUY 300 or more bbls. daily production preferably with undrilled locations. Confidential. Room 807, 465 Calif. St., San Francisco 4.

FOR SALE: An established, profitable, oil well servicing business with approximately 75% of business volume located in a lucrative oil well area. All equipment in good condition. Owner wants to retire. Inquire Wittman Well Service, 308 N. Morton, Okmulgee, Oklahoma. Phone 2287.

FINANCIAL CONTACTS. Underwriters. Brokers, Private Finders of Capital reached. No shopping. Confidential. FREE ENTERPRISE ASSOCIATES, 817—51st St., Brooklyn, N. Y.

WELDED PIPE AND TUBING. Volume users of welded pipe and tubing interested in the formation of a new welded tube company are invited to write to the box below. Box J-889, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS OPPORTUNITIES

MOBILE HOMES, Office Trailers: Sales, leases, terms. MOBRO CORP., 9441 East Admiral Pl., Tulsa, Okla. Phone TE 5-0283.

OIL MEN

HERE IS THE IDEAL DIRECTIONAL DETECTOR FOR OIL DETECTION AND ITS APPROXIMATE DEPTH

This Direct Reading Detector can tell the presence or absence of oil to a depth of 3 or more miles; also tells if there are one or more zones and the limits of production outlined around a wildcat producing well; outlines faults; underlying water surveying. Can test ground equally well from a helicopter or water transport.

Reply to HENRY A. DODGE

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Youngstown Sheet and Tube Company Inside Back Cover

NATIONAL "COG"* SEPARATORS DO THE JOB

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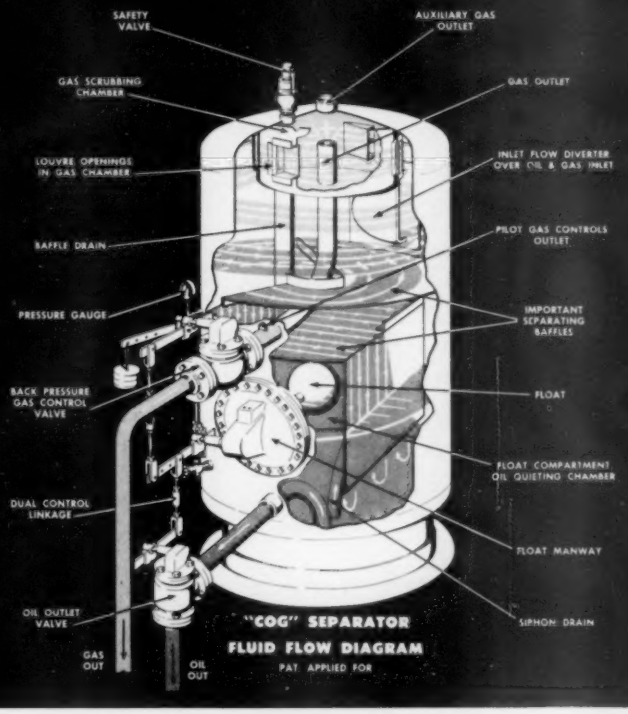
IT'S WHATS IN A SEPARATOR THAT COUNTS



"COG" SEPARATOR
FLUID FLOW DIAGRAM
PAT. APPLIED FOR

FOR MAXIMUM CONSERVATION OF OIL AND GAS

FLOW DESCRIPTION

The incoming well fluid enters the separator through a specially designed extra heavy cast steel diverter that turns the well fluid against the circular side walls of the separator, thus giving the incoming fluid centrifugal motion. An adequate side wall wear plate at the inlet prevents wall erosion.

OIL STREAM

The oil travels circumferentially about the separator in a relatively thin film, thereby presenting a larger surface from which the entrained gas is "broken out." This larger oil surface contributes toward greater oil capacities. The greater the fluid volume at the inlet, the greater the initial fluid velocity and the longer the scrubbing travel against the side wall of the separator; that is, the higher the jet velocity at the inlet, the farther the fluid will travel around the side wall of the separator before coming in contact with the first horizontal baffle plate.

Here the liquid continues to be spread in a thin film forcing more gas to be liberated, then the liquid cascades from the first horizontal baffle plate down to the top of the quieting chamber to continue its travel in a thin film. The liquid flows over the quieting chamber roof and side wall. Note that oil is collected outside of the quieting chamber and has further opportunity to liberate entrained gas. The oil in this chamber containing the least entrained gas is drawn off the bottom and flows under the baffle into the final quieting chamber. The oil is withdrawn from the bottom of the separator through a siphon oil outlet.

Free gas is prevented from entering the quieting chamber which assists greatly in producing early equilibrium at the separator pressure. The quieting chamber provides a relatively quiet surface within the separator on which the float rides thus conveying smooth action to the oil valve actuating equipment.

GAS STREAM

The gas stream, after initial or inlet separation, travels a well designed tortuous path, such that proper velocities are maintained through the gas scrubbing stages. The gas stream undergoes centrifugal scrubbing against the separator shell, against the outer surface of the gas chamber and through numerous louvre openings in the chamber wall as it enters the chamber. Inside the chamber it is further scrubbed on the inner walls. The oil that is entrained with the gas is drained away from the scrubbing gas stream through the drain pipe to the quieting chamber.

NEW IMPORTANCE of DE-GASSING OIL

THE "COG" WILL HANDLE MORE OIL TO THE SAME DEGREE OF DE-GASSING THAN SEPARATORS OF THE SAME RETENTION VOLUME; or, DO A BETTER JOB OF DE-GASSING AT THE SAME THROUGH-PUT of other types of separators of the same retention volume.

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

*REGISTERED TRADEMARK

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3. Line up characteristics are excellent
4. Weldability is outstanding
5. Long lengths save you time and trouble

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Youngstown

ELECTRIC WELD LINE PIPE

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THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices: - - - Youngstown 1, Ohio.

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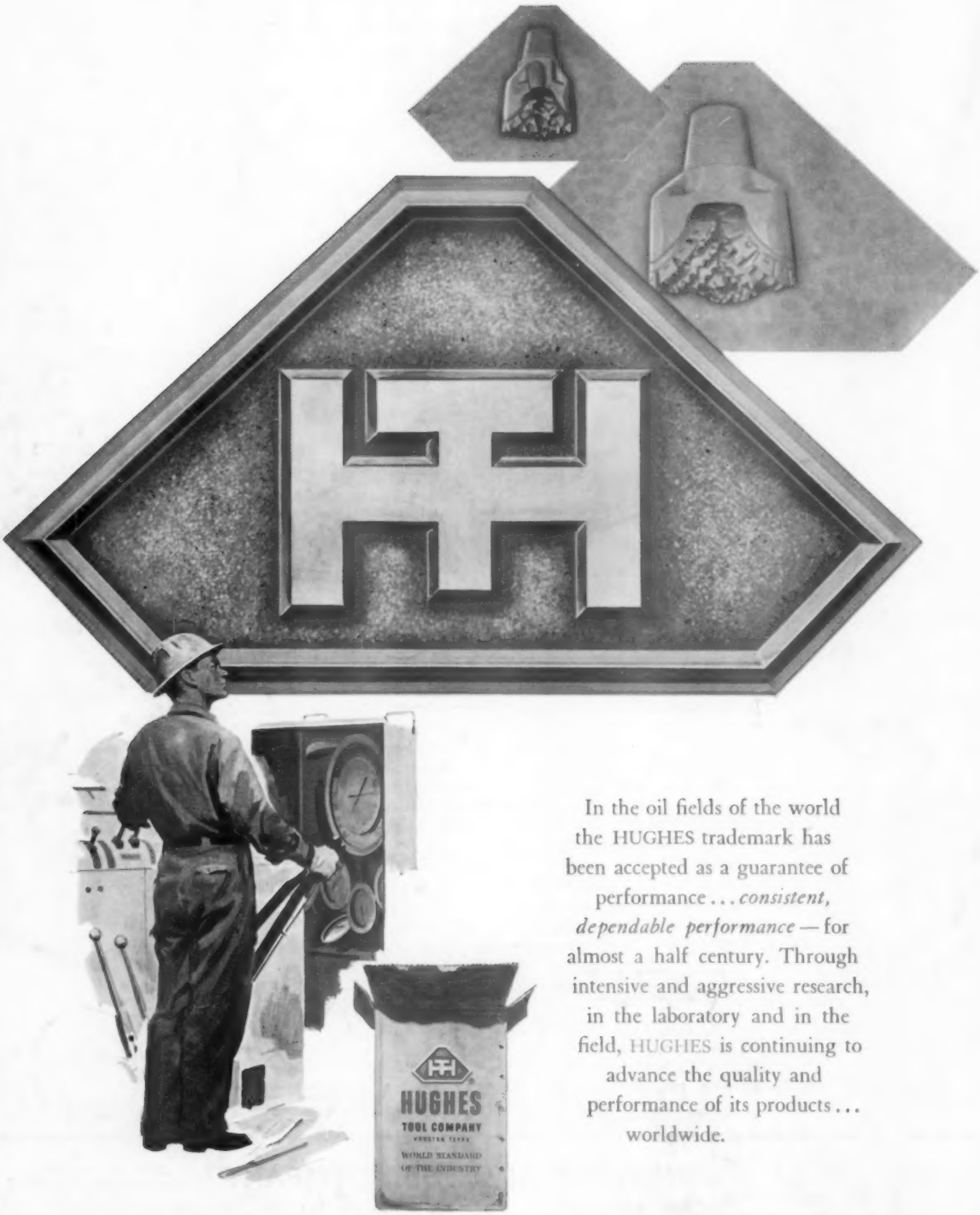

In the oil fields of the world the HUGHES trademark has been accepted as a guarantee of performance . . . *consistent, dependable performance* — for almost a half century. Through intensive and aggressive research, in the laboratory and in the field, HUGHES is continuing to advance the quality and performance of its products . . . worldwide.